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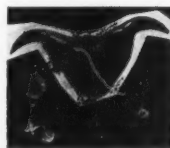
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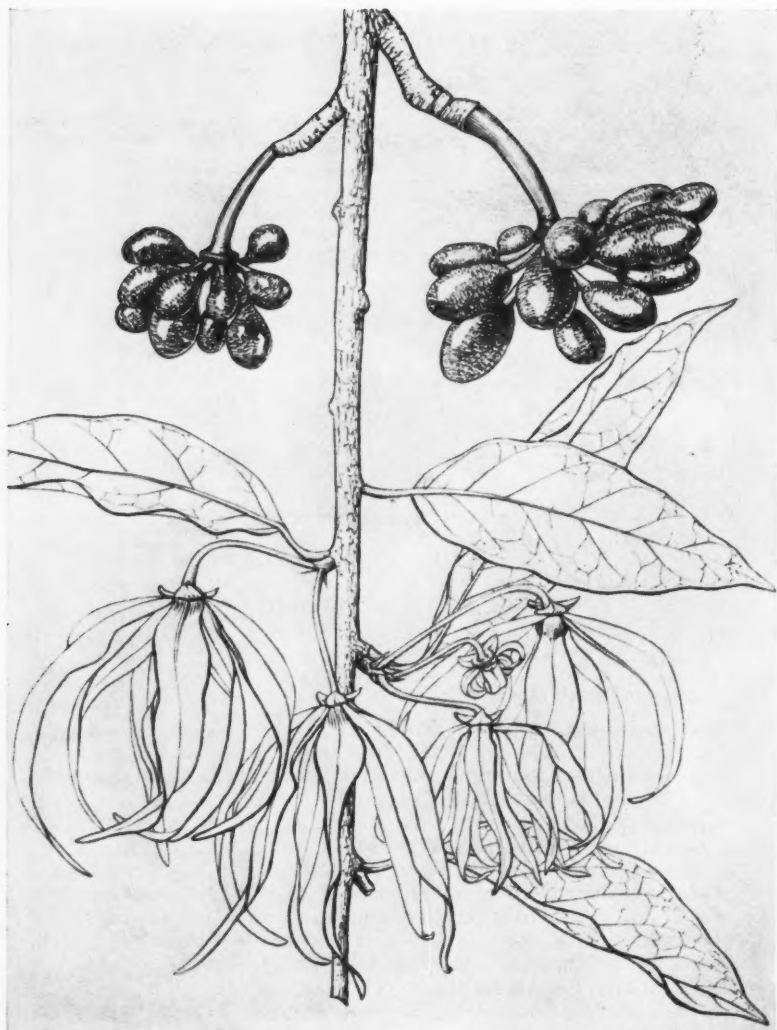
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OCTOBER COVER ILLUSTRATION



A seed of the Chinese Waterchestnut contributes the thick, bony bull's head with its opposite, long recurved horns. Witchweed, a newly introduced parasitic herb, has a nutmeg-like seed which might be the smallest known seed. The seaurchin-like figure is the seed head of *Uncarina peltatum*; while the other three giving close-up views of this capsule may also bring other sea creatures to mind. They are but three of the 17,000 species of seeds curated in the Seed Collection of the U. S. Department of Agriculture.

See Page 325



WATER COLOR DRAWING—G. A. C. HERKLOTS

Canangium odoratum

(See page 349)

Some Shade and Ornamental Maples

Part I

CURTIS MAY*

Maples are among the best known, commonly planted, and widely distributed shade, street, park, and ornamental trees in the United States. A report of the Shade Tree Laboratory of the University of Massachusetts attests their popularity by stating that about seventy-five per cent of the trees planted in 1956 by over two hundred cities in Massachusetts were maples. Donald Wyman states that the Arnold Arboretum has a hundred and fifty-six varieties, that about two hundred and fifty are available in arboreta and botanical gardens of America, and that over a hundred species and varieties are commercially available from American nurseries. The American Association of Botanical Gardens and Arboreta recently published a booklet by Brian O. Mulligan entitled *Maples Cultivated in the United States and Canada* (13).** In this work, Mulligan listed species and varieties known to be growing in arboreta and botanical gardens in North America and their locations. The genus *Acer* holds much promise as a source of acceptable shade and ornamental trees. Its many species, varieties, and cultivars deserve more attention than has heretofore been given them. More exploration, wider testing, and distribution are in order. Only a few of the better known maples are discussed in this article.

Maples range in size from the large Red, Sugar, and Sycamore Maples, which often reach heights of seventy-five to a hundred and twenty feet, to the small Japanese Maple, which rarely exceeds thirty-five feet and is usually less than twenty-five feet tall. A few species are shrubs. Crowns of maples vary in form from wide spreading to pyramidal or columnar. The foliage may be dense and dark green, as on Norway Maple, or thinner and light green, as on Silver Maple. Varieties of maple with reddish, purplish, or variegated foliage are available.

Of the over one hundred recognized species of maple, only thirteen are native to the United States, but several exotic species have been widely planted and many others may be found in botanic gardens or special collections. In North America maples are native from Central America northward to Coastal Alaska and Canada. They occur in western Europe and eastward across southern Europe to Turkey and India and in south-east Asia. Many species are native to China and Japan.

Maples will grow on a variety of soil types, but most will grow best on a rich, well-drained loam. They will grow on moderately acid, neutral, or slightly alkaline soils. They commonly produce many roots just beneath or at the surface of the ground. Roots of large maples may interfere with smooth operation of the lawn mower. Grass may not grow well under large maple trees because their shallow roots absorb much water from near the surface of the soil and also because the tree casts heavy shade. Roots of Red Maple and Silver Maple often grow through tiny openings in sewers and drain tile systems and then plug the pipes by their vigorous growth. Buttress roots of maples planted too close to the pavement often heave and crack sidewalks.

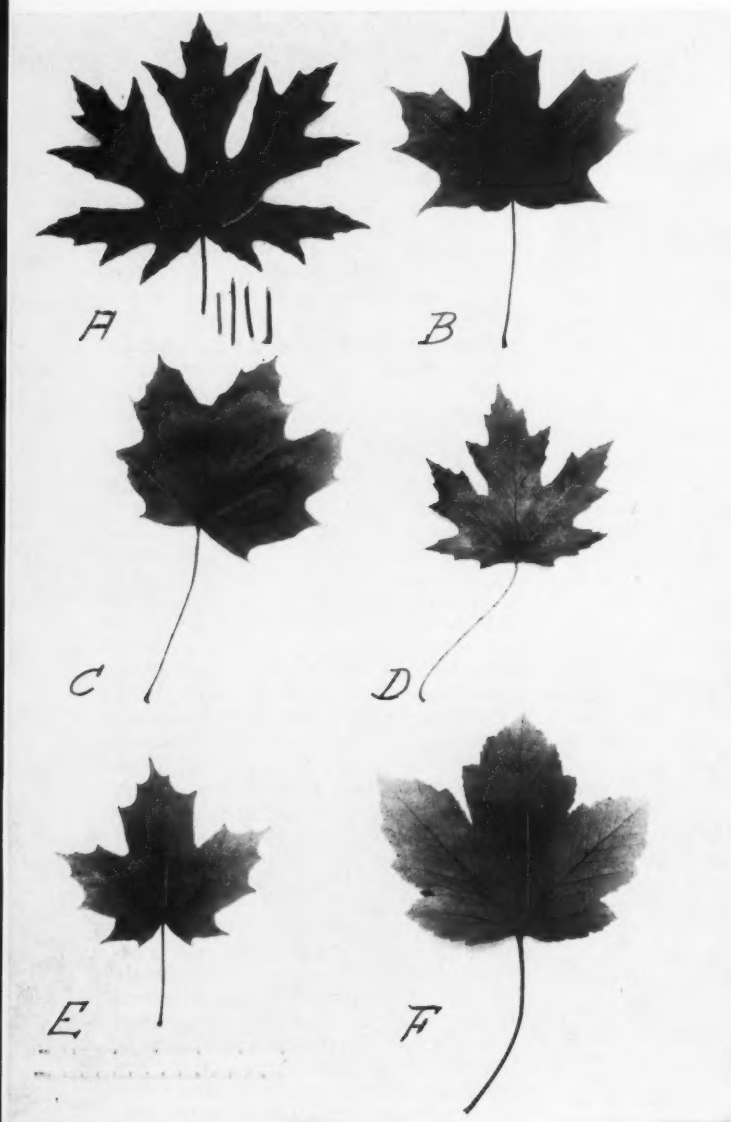
Maples rank high in economic value. In addition to their worth as shade, ornamental, and timber trees, they provide food and cover for wild life. Also one cannot forget the delicious syrup and sugar obtained from *Acer saccharum*.

Leaves of most species of maple are simple and lobed with each lobe more or less pointed, but leaves of a few species are compound with three to five pairs of leaflets. Leaves are opposite on the twigs. Those of most species are deciduous in autumn. Figures 1, 2, and 3 illustrate the great diversity of forms of maple leaves. Leaves of some species develop gorgeous orange and red coloration in autumn; others turn pale to brilliant yellow. But leaves of some species pass directly from green to brown. Leaves of some selections of the Japanese Maple are red when they expand in spring, gradually become green with the

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**See literature citations concluding this article.

Part 2, concluding this discussion of the maples for the home grounds, will appear in an early issue of the magazine.

**Figure 1***A. Bigleaf**B. Black**C. Norway**D. Silver**E. Sugar**F. Sycamore*

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**Figure 2***A. Hempleaf**C. A. cissifolium**E. A. mandschuricum*

B. Hornbeam

D. Rocky Mountain

F. A. miyabei

A. Boxelder

C. David

E. Amur

G. Hedge

B. Japanese

D. Nikko

F. Paperbark

H. Red



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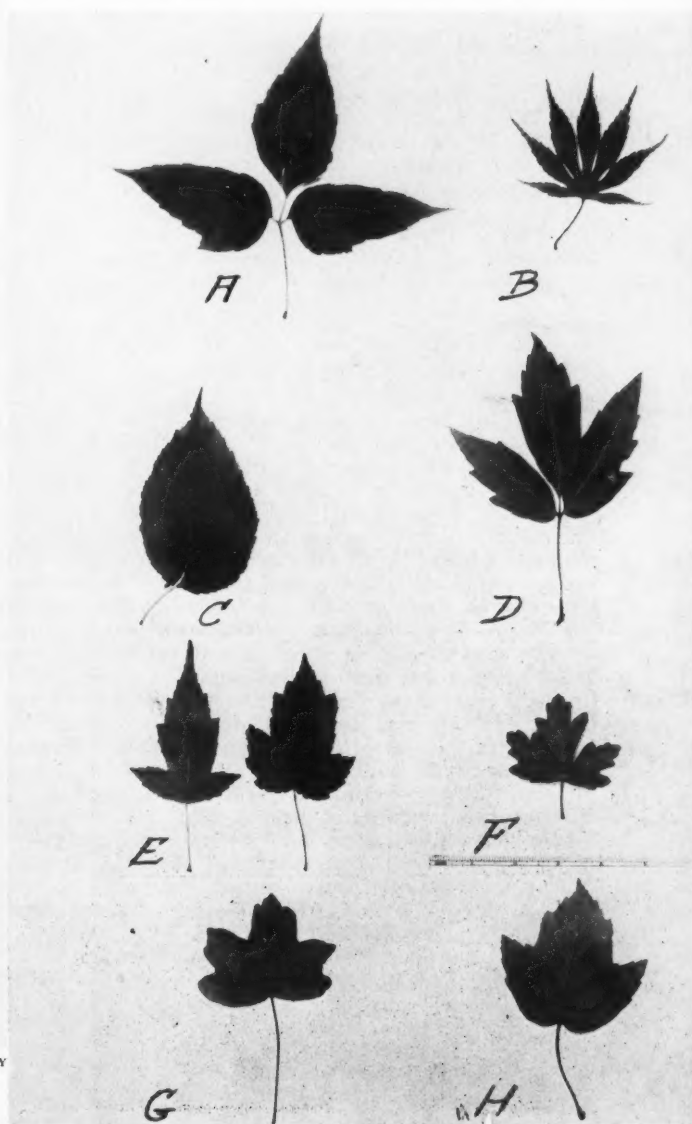


Figure 3

advance of summer, and turn red again in autumn; but leaves of other selections remain red throughout the summer. In one experiment, leaves of Red Maple seedlings (*A. rubrum*) grown in a warm greenhouse throughout the year developed typical brilliant red, orange, and yellow autumnal colors when they became senescent.

Maples have ancient lineage. Fossil imprints of their leaves have been found in rocks of the Eocene epoch.

Only rarely do all flowers of individual maple trees have both functional stamens and pistils or only functional stamens or pistils. Flowers are borne in clusters produced from separate lateral or terminal buds and expand in spring before, at the same time, or after leaves develop, depending upon species. The fruit of maple is a samara and generally is winged. The basic chromosome number in vegetative cells is 26 (2N).

Propagation

Maples are propagated from seed and, vegetatively, by cuttings and by budding and grafting. Seed of some species of maple will germinate as soon as it ripens, but seed of others requires an after-ripening dormant period before it will germinate. Dormancy of maple seed may be due to impermeable seed coats, to immature embryos, or to both. In most species germination is epigeous (cotyledons emerge above ground) but in Sugar Maple it is hypogeous (cotyledons remain below the surface of the ground). Information about propagating maples from seed is given elsewhere in this paper in the discussions of the more important species.

Some success in rooting cuttings of maples under mist has been reported. Wells (18) stated that cuttings of the Coliseum Maple (*A. cappadocicum* f. *rubrum*

(Kirchn.) Rehd.) taken on July 20 and placed under interrupted mist for twenty seconds in every five minutes had rooted by September 6. Cuttings of *A. saccharinum* L. (Silver Maple) made from wood of the current season and collected on July 20 also had rooted by September 6. All cuttings were dipped in a rooting powder containing indolbutyric acid. F. G. Meyer in a personal communication stated that cuttings of Sugar Maple (f. *monumentale*) taken May 15 in St. Louis rooted under mist.

Coggeshall (5) reported considerable success in rooting several species of Asiatic maples from cuttings taken in summer and stuck in sand after treatment with Hormodin No. 3. The cuttings were kept under a polyethylene plastic cover supported by a wire frame. He stated that one watering within a three-to-five-week period was sufficient but that extra shade between noon and 5 p.m. was necessary on days when the temperature went above 95° F. Shade was provided by one layer of saran cloth that excluded forty-eight per cent of the light. Cuttings were from two to four inches long, bore two to five leaves, and remained in the bed for four to twelve weeks. The percentages of rootings of softwood cuttings from young seedlings were higher than those of cuttings from old plants of *A. buergerianum* Miquel, *A. ginnala* Maxim., and *A. triflorum* Komarov. Cuttings of *A. griseum* (Franch.) Pax did not root.

The highest percentages of cuttings rooting for *A. grosseri* var. *hersii* (Rehd.) Rehd., *A. mandschuricum* Maxim., and *A. miyabei* Maxim. were, respectively, forty, five, and eleven. Coggeshall classifies these three species as hard-to-root. The following table reprinted with permission, gives the results of some of Coggeshall's tests as reported in the *American Nurseryman*, May 1, 1957 and in *Trees*, Sept.-Oct., 1957.

	Age of Parent (years)	No. Cuttings	No. Rooted	Date Made
<i>A. barbinerve</i>	39	100	87	8/8
<i>A. buergerianum</i>	19	100	11	7/6
<i>A. capillipes</i>	37	100	91	8/17
<i>A. carpinifolium</i>	37	100	69	5/23
<i>A. cissifolium</i>	37	100	72	5/11
<i>A. tataricum</i>	26	100	63	8/16
<i>A. tegmentosum</i>	31	75	67	8/15
<i>A. triflorum</i>	33	100	0	7/9
<i>A. tschonoskii</i>	39	100	36	8/15



ARNOLD ARBORETUM

Figure 4. Acer ginnala, the Amur Maple

Selected Species

Amur Maple (*Acer ginnala* Maxim.) (Fig. 4) was brought to the United States about 1860. It is native to central and north China, Manchuria, and Japan. It is hardy in plant zone 2. In Montana it will grow at the lower elevations. It is semi-hardy under dry land conditions in North Dakota but needs extra water on dry upland sites. Amur Maple is not recommended for shelter belts there.

This species grows to about 20 feet in height and forms a dense-branching, upright, rounded crown. It can be used as

a specimen small tree or for a screen planting. The cultivar Durand Dwarf is shrubby.

Leaves are $1\frac{1}{2}$ to 3 inches long and have serrated margins and 3 lobes (Fig. 3-E). The terminal lobe is longer than the lateral lobes. Leaves turn red or scarlet in autumn.

The fragrant, yellowish flowers are produced in long peduncled panicles. The bright-red young fruits contrast in summer with the green leaves.

Seed ripens in late summer. The average number of seed per pound is 15,000. For spring planting, seed should be stored for 150 days or more at 41°F. Seed may also be sown outdoors in autumn. Seed will germinate at 50°F. Average

germination is 85 to 90 percent. Seed usually exhibits double dormancy, that is, the embryo is immature when the fruit ripens and the seed coat is impermeable to water. Coggeshall (3) reported in the proceedings of the 5th Annual Meeting of the Plant Propagators Society that approximately 90 percent of softwood cuttings from forced plants rooted.

Bigleaf Maple (*Acer macrophyllum* Pursh) is native to western North America from Alaska to California. It grows along streams at elevations up to 5,000 feet in the Sierra Nevada and also along streams in coastal ranges. In Washington and Oregon, it grows from sea level to 3,000 and in California to 6,000 feet. It is a handsome tree with rounded crown and may attain a height of 100 feet or even more. Trees 65 to 75 feet in height at maturity are more common, however. The species makes its best growth on rich alluvial river bottom soils in Washington and Oregon. Magnificent Bigleaf Maple trees grow on the Olympic Peninsula. Bigleaf Maple is hardy in plant zone 6.

The trunk often reaches 2 feet in diameter and sometimes may be 5 feet in diameter at the breast height. Bark is gray-brown, thin, and relatively smooth at first but becoming deeply furrowed.

The paired, cordate leaves have 3 to 5 lobes and are 8 to 12 inches broad. Leaves are dark green on the upper surface and pale green on the lower surface (Fig. 1-A). In mass the foliage may appear bluish green. In autumn the foliage turns yellow to bright orange. Milky sap exudes from petioles when leaves are broken off.

In late spring the yellow, fragrant flowers are produced in pendulous panicles 4 to 5 inches long. Staminate and pistillate flowers occur on the same tree. Wright (20) gives 26 as the 2N chromosome number.

The 1½- to 2-inch long fruits, which are produced in pendulous clusters 4 to 6 inches long, mature in autumn but hang on the tree until late winter. The wings may spread at right angles or may be nearly upright.

Of the 2,700 to 3,100 seeds per pound, up to 90 per cent may be viable. Seed may be stored at 41°F for 60 to 70 days. Nordine (14) states that seed should be

sown after ripening in autumn. (See Sugar Maple for seeding practices.)

Bigleaf Maple casts dense shade and makes a heavy demand on water and soil fertility. It is difficult to grow grass beneath Bigleaf Maple and it is somewhat dirty as a lawn tree. But it is good for rural roads and country homes. Its shallow roots often raise sidewalks when trees are planted close to them. Because of its vigorous growth, frequent pruning may be required to keep it from interfering with utility lines that may be near it. The maximum life is 150 to 200 years. Sprouting from stumps is common. Bigleaf Maple does not thrive in eastern United States.

Bigleaf Maple is susceptible to verticillium wilt and is frequently attacked by aphids, which produce an abundance of honeydew. A twig blight of unknown cause has been observed in the Pacific Northwest. Nevertheless, in the Pacific Northwest Bigleaf Maple is a desirable shade tree where the planting site is adequate for its development.

Bigleaf Maple will produce sugar equal in quantity and quality to that of *Acer saccharum* Marsh. according to Van Dersall (17). This maple is browsed by deer. The wood is used for furniture. Large burls provide figured wood. A columnar cultivar, Seattle Sentinel, has been selected and is growing at the University of Washington Arboretum at Seattle.

Black Maple (*A. nigrum* (Michx.) L.) is sometimes considered a variety of Sugar Maple. Black Maple is native to the eastern part of the central Great Plains and Northeastern United States and adjacent southern Canada. It may reach 120 feet in height. It has dark to almost black bark. Bark of branchlets is orange-colored. The usually 3-lobed, heart-shaped leaves are 4 to 6 inches broad with the sides of the blades drooping (Fig. 1-B). The lobes have short points and are sparingly, coarsely, and bluntly toothed. Leaves are green and pubescent on the lower surface. They turn bright yellow in autumn.

Flowers are yellow, about ¼ inch long, and borne on slender hairy pedicels about 2½- to 3-inches long. Staminate and pistillate flowers may be found in the same cluster or in separate clusters, on the same tree or on different

trees. The 2N chromosome number is 26, according to Wright (20).

The fruits, which ripen in early autumn, have widely divergent wings $\frac{1}{2}$ - to 1-inch long. Seeds are smooth and bright reddish-brown.

Black Maple grows best on a fertile, well-drained soil. (Refer to Sugar Maple for discussion of culture.)

Boxelder (*Acer negundo* L.), also known as Ash-leaved Maple and Manitoba Maple, is a native American species widely grown for shade. The cultivars Arizona, New California, Inland, and Texas are available. Cultivars of the Violet Boxelder (*Acer negundo* var. *violaceum* (Kirchn.) Jaeg.), the young branches of which are violet-bluish, are Curlyleaf, Goldedge, Goldspot, New California, Silverleaf, and Yellowleaf.

Boxelder is native to the eastern and Central States, to the Southwest and to California. It is hardy in eastern Montana and northeastern Wyoming.

Under favorable conditions, Boxelder trees may reach a height of 75 feet but mature trees about 50 feet in height are more commonly seen. The crown usually is compact and rounded and the trunk usually short, often divided, and crooked. Old bark is pale gray and has narrow, flat-topped ridges, which crack horizontally to form scales. Young bark is greenish to purplish, and has many prominent lenticels. Bark of twigs often has a powdery white bloom.

Leaves are compound with 3 to 5 ovate or oblong lanceolate leaflets. Leaflets have coarsely toothed margins or may be 3-lobed and comparatively smooth and are 3 to 5 inches long (Fig. 3-A). Leaves may be pale green or chlorotic on some alkaline soils.

Flowers appear with or before the leaves in April or May. The light-green staminate and pistillate flowers are borne on different trees. The staminate flowers are borne on pendulous corymbs, the pistillate flowers in pendulous racemes. Wright (20) reports that the 2N chromosome number is 26.

The 6- to 8-inch long cluster of fruits ripens in late summer and hangs on the tree into the following spring. The wings of the keys are broad at the apex and narrow at the base where they join the pointed nutlets that contain the seed. Seeds average 11,800 per pound.

Seed may be sown in autumn or refrigerated at 41°F. until early spring. Seed will germinate at 50°F. night and 77°F. day temperatures.

Boxelder can also be propagated by rooting hardwood cuttings.

Boxelder grows rapidly under the favorable conditions of a well-drained but moist, fertile soil but it will also grow on relatively dry sites. It is useful on the Great Plains for shelter belt planting because it will survive droughts and low temperatures. The root system is commonly shallow but may be deep on gravelly soils. Trees may live for 60 or rarely, 100 years.

Boxelder is in less favor now than formerly because of its tendency to be relatively short-lived, and its susceptibility to decay and consequent wind- and ice-storm breakage. It is also a free-seeding species. Use of male trees only would eliminate the seedling nuisance. Boxelder bugs, which feed on the foliage and in autumn often invade houses, can be controlled by spraying the trees with an insecticide. Boxelder roots sometimes grow into sewers and clog them.

Boxelder in nature is browsed by deer. Some low-grade sugar is made from its sap in Pennsylvania. The wood is used for crates, slack barrels, pulp, fuel, and similar items. The wood is creamy white soft, close-grained, and weighs about 26 pounds to the cubic foot. The pink stain sometimes present in boxelder wood is caused by a fungus.

Coliseum Maple (*Acer cappadocicum* Gleditsch.) (Fig. 5), native to eastern Europe and to Asia, is hardy in plant zone 4, and grows to a height of 50 feet. Its leaves are 5 to 7 lobed, 3 to 6 inches broad, light green, and lustrous. They turn yellow or remain green until they fall in autumn. They have milky sap. Greenish flowers are borne in upright peduncled corymbs. This species resembles the Norway Maple. Wright (20) gives the 2N chromosome number as 26. A variety *A. c. rubrum* (Kirchn.) Rehd. with redness in leaves of terminals is used as a street tree in Vienna, Austria. Leaves of the cultivar *aureum* are yellow in spring and autumn. *A. c. f. tricaudatum* (Rehd.) Rehd. has 3-lobed leaves, each lobe long and pointed. Coliseum Maple should be tested more widely in streetside plantings.



E. H. SCANLON

Figure 5. *Acer cappadocicum*, the Coliseum Maple

David Maple (*Acer davidii* Franchet), native to central China, is a handsome tree reaching a height of 50 feet. It is hardy at least as far north as Boston, Massachusetts. Young branchlets are slender and green or greenish purple, becoming yellowish to brown with age. Leaves are ovate or oblong-ovate, $2\frac{1}{2}$ to 8 inches long. They have pointed lobes and the base of the leaf is more or less rounded. Young leaves are green with rufous hairs along the veins on the underside but become smooth later (Fig. 3-C). They turn golden yellow or purple in autumn. Flowers are greenish yellow.

The fruit ripens in autumn. Seed sown in autumn will germinate the following spring. Propagation is by seed.

Evergreen Maple (*Acer oblongum* Wall. ex DC.) develops pink young foliage just before or at the time the old leaves fall. Leaves are entire, oblong-lanceolate. The crown is oval to round, less shapely when old. Evergreen Maple

grows satisfactorily around Los Angeles, California, and is planted in southern Europe. It is native to the Himalayas and to West and Central China.

Florida Maple (*Acer barbatum* f. *floridanum* (Chapm.) Pax) is native from southern Virginia southward in southeastern United States and is hardy in plant zone 9. Florida Maple rarely reaches 50 feet in height. The normally rounded crown bears dense foliage (Fig. 6). Bark is smooth and pale gray becoming dark and furrowed at the base of the trunk of older trees. Leaves are mostly 3-lobed, truncate at the base, and $1\frac{1}{2}$ to 3 inches wide. At maturity leaves are dark green and lustrous on the upper surface and pale on the lower. They turn yellow and scarlet in autumn. The base of the petiole is enlarged and nearly encircles the branchlet. Flowers, which expand with the leaves, are borne on long, slender, slightly hairy pedicels in many-flowered corymbs. The yellow calyx persists under the fruit. Fruits are

green and $\frac{3}{8}$ to $\frac{3}{4}$ inch long. Seeds are bright red-brown, $\frac{1}{4}$ inch long, and mature in autumn. Florida Maple grows best on a well-drained but moist site in full sun. It is sometimes considered a variety of the Sugar Maple.

Hedge Maple (*Acer campestre* L.) usually is less than 50 feet in height at maturity but the variety *austriacum* may reach that height. It is hardy in plant zone 4. This native of Europe and western Asia was brought here in early colonial times. The crown is moderately dense with dull green foliage. Bark on the trunk is grayish and produces corky flakes on branches.

Leaves are 3- to 5-lobed $1\frac{1}{2}$ to $3\frac{1}{2}$ inches long, and dull green. Margins of leaves are smooth, but the central lobe may be slightly 3-sectioned (Fig. 3-G). A milky sap may exude from the base of the leaf when it is removed from the tree. Autumn leaf color is yellow and green.

Flowers are produced in erect, hairy corymbs. Seeds mature in late summer. They should be stored at about 40°F. for a year before planting according to Nordine (14).

The 2N chromosome number of vegetative cells is 26 according to Foster (8).

Hedge Maple can be used with good

results as a screen hedge from Long Island southward. It will grow on relatively dry soil. The variety *A. c. compactum* is usually a compact shrub. *A. c. var. austriacum* (Tratt.) DC. is usually a round-headed tree. *A. c. f. postelense* Lauche ex Schwerin has golden yellow leaves when young.

Hemleaf Maple (*Acer argutum* Maxim.) is a small tree which reaches a height of about 25 feet. Leaves are broadly ovate, 5- or 7-lobed, 2 to $3\frac{1}{2}$ inches long, and pale green (Fig. 2-A). Staminate flowers are borne in short racemes from lateral leafless buds; pistillate flowers in peduncled, multi-flowered, pendulous racemes. This graceful Japanese species was introduced in 1879. It is winter hardy at the Arnold Arboretum and presumably in zone 5.

Hornbeam Maple (*Acer carpinifolium* Sieb. & Zucc.), native to Japan, was brought to the United States in 1881. It has grown well at Washington, D.C., and at the Arnold Arboretum. It is reported to be hardy in plant zone 5. Hornbeam Maple grows to a height of about 30 feet. The crown is more or less vase-shaped with numerous stems from the

CURTIS MAY



Figure 6

Acer barbatum
f. *floridanum*,
the Florida Maple

base. The acuminate and doubly and sharply serrate shape of the 3- to 6-inch long leaf resembles closely that of the hornbeam (Fig. 2-B). Leaves turn brownish yellow in autumn. The staminate flowers have no petals and are produced on few-flowered racemes. The pistillate flowers have petals and are borne on longer racemes. The chromosome number of vegetative cells is 52, according to Foster (8).

Seed may be sown outdoors in autumn or may be stored under refrigeration and sown in the spring. Coggeshall (5) reported 69 per cent rooting of cuttings taken from a 37-year-old tree on August 10.

Japanese Maple (*Acer palmatum* Thunb.) is one of the most beautiful and widely used small ornamental trees. (Fig. 7). The striking red colors of the leaves in spring and again in autumn, and of some selections throughout the growing season, are outstanding.

This maple, native to Japan and Korea, was brought to the United States in 1820. The species is hardy in plant zone 5, but some selections are doubtfully hardy in the northerly part of the zone. Frosts in early autumn and late spring may kill the ends of the branches and disfigure the trees, especially selections with variegated leaves.

Mature trees commonly are low and shrubby, but some grow into small trees up to about 20 feet in height. At least one variety has somewhat pendulous branches. Multiple trunks are frequently produced. The bark is dark gray. Foliage is dense on trees in full sun but may be thin on those growing in shade.

Leaves are 5- to 9-lobed and up to 4 inches in width (Fig. 3-B). The leaves of some varieties are conspicuously deeply indented, incised, or serrated; the edge of leaves of other varieties are smooth. Color of leaves varies from green through light red, scarlet, bronze red, to deep red or purplish red. The front cover of the October 1958 issue of *The National Horticultural Magazine* illustrates leaf forms of 7 varieties of Japanese Maple.

The samaras mature in autumn and should be collected then if seed is desired.

Vegetative cells contain 26 (2N) chromosomes according to Foster (8).



CURTIS MAY

Figure 7

Pendent clusters of staminate flowers of *Acer palmatum*, the Japanese Maple, are produced when its leaves expand

Japanese Maple may be propagated from seed. Seed may be stored over winter in a cool place such as a kitchen refrigerator and planted the following spring. Seed planted outdoors in autumn will germinate the following spring. The seed may also be stratified in slightly moist sand in a can buried in the earth. The container should have a loosely fitting lid that will exclude water and rodents but permit some aeration and should have drainage holes in the bottom. Seed stratified in this manner will germinate promptly at the end of cold weather and must be planted promptly after germination. The early-emerging seedlings should be protected from spring frosts. Seed from special varieties may produce some seedlings like the seed source tree; but most of the seedlings will be different. The purple-leaved and the red-leaved varieties are said to produce many seedlings true to color. Varieties are usually propagated by budding and grafting.

Wells (18) in his book, *Plant Propagation Practices*, states that seed collected

just before it is fully ripe and sown immediately in outside beds will germinate evenly the following spring, but if allowed to ripen on the tree and then dried before sowing, some seeds will germinate the first and some the second spring after sowing. Dry seed will germinate more evenly if soaked in warm water (110°F.) for 48 hours before it is planted according to Wells.

Young seedlings out-of-doors should be shaded with half-lath during their first growing season. Two applications of fertilizer per season will promote vigorous growth. One application may be made in late spring and another in late summer about the time of the second flush of growth.

Varieties are usually propagated by budding and grafting onto seedlings of the species. Grafting may be done in the greenhouse in March or April, or in the field in early August. Two- or three-year-old actively-growing seedlings should be used for stock plants. Scion wood may be one or two years old and collected when needed or taken in autumn and held in cool moist storage. For summer grafting, well-ripened wood of the current season's growth should be used for scions. Side grafts are commonly made, but other types of grafts have been successful. Stems having a diameter of one-quarter of an inch or somewhat larger are easier to handle than smaller stems. Union of grafts is usually made in about three weeks. Hold back top growth as much as possible until union is made between scion and stock. In the greenhouse 65°F. is a satisfactory temperature until union is made. Budding may be done in August.

Propagation by cuttings and by layering has been reported but does not give uniformly satisfactory results for most varieties. Some softwood cuttings taken in March from forced plants will root.

Wells (19) reported that softwood cuttings of the variety *atropurpureum* taken in June in southern New Jersey rooted well when fogged abundantly. The rooting medium was acid peat. Cuttings were 8 to 10 inches long, were treated with 2 percent indobutyric acid in talc, and were wounded at the base. Rooting began in 2 weeks; in 5 weeks 6,500 of 10,000 cuttings had rooted and were potted. Eventually 8,000 of 10,000 cuttings rooted.

If only a few plants are needed they may be propagated by inarching of seedlings to the desired plant in August and cutting them apart the following spring. F. L. Smith described the technique in the January 1954 issue of *The National Horticultural Magazine* (15).

In the greenhouse with 16-hour illumination daily, 10-month-old seedlings broke dormancy 2 weeks after removal of their old leaves on November 30, 1955. Seedlings stored at 35° F. for 60 days broke dormancy soon after they were set on the greenhouse bench and exposed to 16-hour daily illumination. Such treatments may be useful in stimulating understocks into growth for earlier season grafting.

Japanese Maple has widely varying growth habits, leaf forms, color, and color retentiveness.

Atropurpureum (Vanh.) Schwerin has mostly 7-lobed deep red leaves which retain color throughout the growing season. The variety *dissectum* (Thunb.) Miquel has green leaves deeply dissected almost to the base and divided into 5 to 9 lobes. *Ornatum* (Carr.) Schwerin has deeply incised leaves which retain their red color or become bronze-red as the season advances. Other attractive selections are listed in nursery catalogs. Krussman (10) describes 40. Mulligan (13) lists Japanese names of selections and gives their English equivalents.

Plants of any size can be successfully transplanted. Large, old plants should be moved with a ball of earth around the whole root system. Transplanting may be done in autumn after the leaves have dropped or in the spring before the buds expand. Trees can be transplanted while in full leaf if precautions are taken to move them without disturbing the functioning of the root system. Transplanted Japanese Maple recovers more rapidly if the weaker twigs and branches are pruned. The vigor and color of old trees with weak, twiggy growth will often be improved by pruning.

Japanese Maple grows best in well-drained, fertile soil relatively high in organic content and in light shade but will also grow satisfactorily in full sunlight. In heavy shade the plants tend to grow tall and have sparse branches and thin foliage. Red-leaved varieties in dense shade tend to become bronzy green.

Good internal soil drainage is necessary for best growth of the trees. If free water accumulates and remains for several days in the soil in which the tree is planted, the roots will gradually die from insufficient oxygen. Poor internal soil drainage results in gradual deterioration of the crown or in sudden drying and dying of the leaves and tree during the growing season.

Applications of fertilizer generally promote vigorous growth. Any good garden fertilizer may be used. Japanese Maple trees usually have some roots near the surface of the ground. These roots may be damaged if the fertilizer is hoed or spaded into the soil. Application of fertilizer to lawns benefits Japanese Maple trees growing on them. Roots will be deeper in a well-drained soil than in a poorly drained clay. Fertilizer may also be applied in holes punched about 8 to 15 inches into the soil. Two pounds of fertilizer per inch of trunk diameter is a safe rate of application.

Mountain Maple (*Acer spicatum* Lam.) is a shrub or small tree rarely attaining a height of 30 feet. It is native from Labrador to Saskatchewan to Iowa and in the Appalachians, south to Georgia. It is hardy in plant zone 2. The trunk is usually short and branches are upright and straight. Trees often develop in clumps.

The 3- or slightly 5-lobed leaves are $2\frac{1}{2}$ to 4 inches long and have coarsely serrate margins. Leaves turn yellow and scarlet in autumn.

Flowers are produced in long, dense, upright racemes after the leaves have formed. Often the staminate flowers open at the tip and pistillate flowers at the lower part of the raceme. The immature fruits are bright red in summer. The fruits ripen in autumn.

The average number of seed per pound is 22,200. Seed may be sown in early autumn or stored for 90 to 120 days at 41°F. For best germination the seed coats should be scarified.

Mountain Maple will grow in part shade and on moist rocky hillsides and bordering ravines. In nature it is found on acid soils.

Mountain Maple is uncommon as an ornamental. It is food for deer, rabbit, and for moose and beaver in the absence of poplar.

Nikko Maple (*Acer nikoense* Maxim.), brought to the United States in 1881, is native to Japan and central China. It is hardy in plant zone 5. Eventually trees of this species may reach 40 feet in height and have a round crown (Fig. 8). Bark of new growth is reddish brown and hairy. Older twigs have light-brown bark with lenticels and are less hairy than new growth. Bark on older parts of branches and trunk is light brown to gray brown, slightly roughened with a pattern of fine fissures.

Leaves are compound. Leaflets are oblong-elliptic, short-stalked, and pointed and have smooth or obtusely toothed margins. They are 2 to 5 inches long and hairy on the lower surface. They redden in autumn. Dried leaves are pleasantly, but mildly, fragrant. The hairy petioles are $\frac{3}{4}$ to $1\frac{1}{2}$ inches long (Fig. 3-D). Flowers are borne in a corymb and open in spring.

Fruits are carried on nodding pedicels. Wings of the samaras are upright and curved inward. Nutlets are thick and hairy.

Nikko Maple with its brilliant scarlet, red, or purple foliage is outstanding in autumn.

Nordine (14) reported that the seed, which ripen in autumn, require a year of cold treatment before they will germinate.

Chromosome number of vegetative cell is 26 according to Foster (8).

Nikko Maple is not a fast-growing tree, but it is attractive and suitable for use where space is limited.

Norway Maple (*Acer platanoides* L.), introduced into the United States in early colonial times from Europe, has found here wide acceptance as a shade tree. It is hardy in plant zone 3. It normally has a short trunk bearing numerous ascending branches that form a rounded crown and carry an abundance of dark-green foliage. Exceptionally large trees may reach 100 feet in height. The bark is dark gray and has narrow ridges and furrows. Winter buds are oval and reddish brown.

Leaves of the species are dark green, 3 to 7 inches in diameter, with 5 lobes each with several marginal points (Fig. 1-C). A milky juice exudes from the petioles of green leaves when they are broken from the tree. Some selections



CURTIS MAY

Figure 8. *Acer nikoense*, the Nikko Maple

have leaves with white blotches, some have leaves with pale yellow or white margins, and some have reddish to purplish leaves. Some selections have 3-lobed leaves. Leaves turn yellow before they fall in late autumn. Because of the abundant foliage, the tree produces relatively dark shade.

Vegetative cells have 26 chromosomes (Meurman (12) and Wright (20)).

The clusters (corymbs) of greenish-yellow flowers expand in late winter or early spring before the leaves. Staminate and pistillate flowers may occur in the same flower cluster, and some flowers may have both stamens and pistils. Staminate flowers are shown in Fig. 9.

The paired, 1½- to 2-inch long fruits, which have wide-spreading wings, mature in autumn.

There are about 2,600 seeds per pound. Seed may be stored at 41°F. for

90 to 120 days. Mature seed may be planted at once out-of-doors. Seed planted in autumn will germinate the following spring. Norway Maple may be propagated from seed. See Sugar Maple for additional information on handling and planting the seed.

Varieties are propagated by budding to seedling stock of the species. Budding practices for Norway Maple differ among experienced nurserymen. McGill (11) reported that in the Pacific Northwest budding is done from late July to the middle of August when the seedling stock is growing vigorously and there is enough sap so that the buds slip easily under the bark. The bud unites with the seedling during the second flush of growth in late summer.

The bud stick should be taken before the terminal bud has formed and while the top ⅓ is so soft that it must be dis-



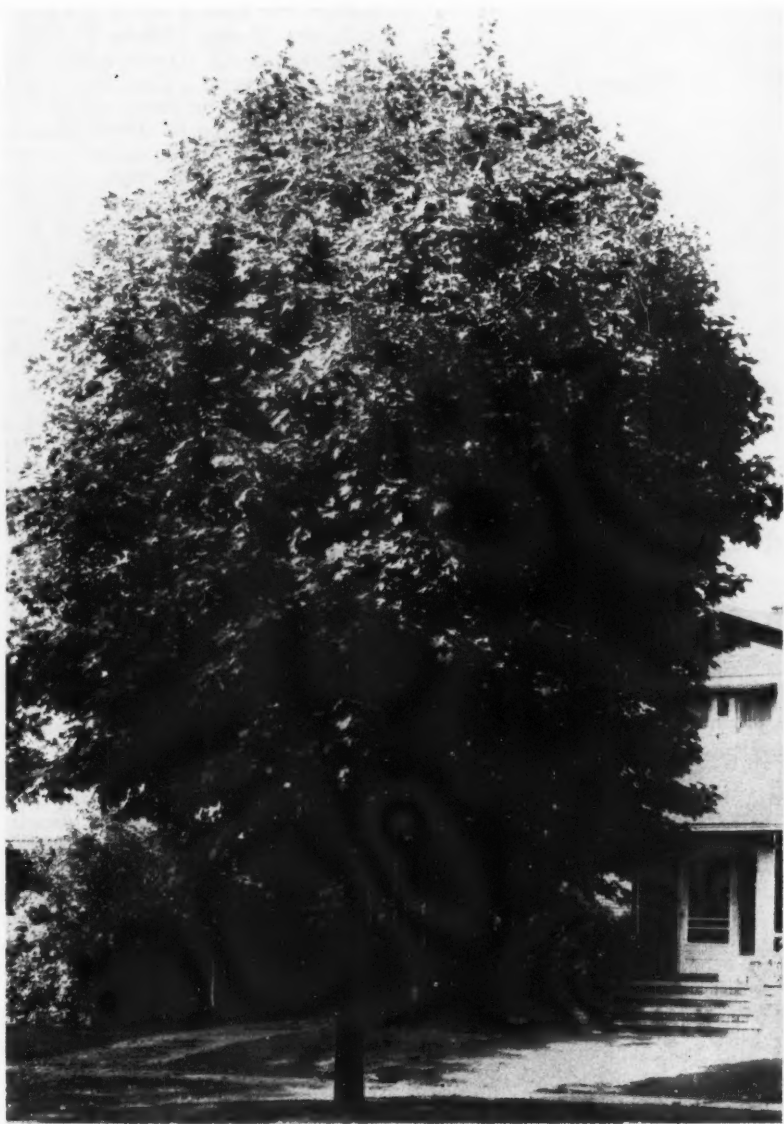
W. H. HODGE

Figure 9. Yellowish-green flowers of *Acer platanoides*, produced just before or at the time the leaves expand

carded. The stick should snap when bent. Budwood should be used immediately if possible or within 48 hours after it is taken.

The leaf should be cut from the bud before it is inserted, but a short length of petiole should be retained. This shades the bud some and helps to keep the bark of the stock from growing over it. All wood should be removed from the bud before it is inserted. Rubber bands may be used to hold the bud in place. The top of the stock should be cut off above the bud just before growth starts in the spring following budding. Budding in spring has given less satisfactory results. Flemmer, in the *Proceedings of the Second Annual Meeting of the Plant Propagators Society*, stated that in the East budding is done in July from fall-planted stock and that a spring surge of vigorous growth is important in obtaining satisfactory results.

Numerous special selections of Norway Maple are available. The cultivar Drummondi has leaves with a border of white surrounding the green central portion of the leaf. The leaves of *A. p. f. Schwedleri* (K. Koch) Schwerin are reddish-purple when they expand in the spring but gradually become green with advance of the season. Bud scales of this variety are reddish-brown on the inner side, and the color is repeated on some petals of the flowers. *Schwedleri* is reported to be less subject than other maples to poor foliage color on alkaline soils. The cultivar Crimson King is said to retain the red color of the foliage throughout the summer. Other cultivars with light to deep-red foliage are Goldsworth Purple and Faassen's Black. Leaves of the cultivar Stollii are purplish when they unfold. Leaves of *A. p. f. variegatum* (Weston) Rehd. have white blotches. Leaves of *A. p. f. aureomargi-*



E. H. SCANLON

Figure 10

***Acer platanoides* 'Cleveland', an erect, ascending
selection of the Norway Maple**

Figure 11

WM. L. G. EDSON



Another erect form of the Norway Maple, *Acer platanoides* f. *erectum*

natum Pax have a yellow margin. The cultivars Almira, Charles F. Irish, and *A. p. f. lorbergi* (Overeynder) Schwerin are globe types. Cultivars Cleveland (Fig. 10), and the forms erectum Slavin (Fig. 11), undulatum (Dieck) Pax, laciniatum (Lauth) Schwerin, and columnare (Carr.) Schwerin are erect, ascending selections. Krussman (10) lists 43 varieties.

Norway Maple trees of any size can be transplanted successfully. The species tolerates a wide range of soil types, withstands unfavorable soil and atmospheric conditions in cities and is moderately resistant to damage from alkaline soils.

On streets the normally dense, low head commonly must be raised by pruning the low branches. The broad crown of the species makes it unsuitable for use on narrow streets. Pruning the lower branches to raise the crown is helpful if one attempts to grow grass in the dense shade cast by a healthy Norway Maple. Young trees should be pruned to develop good trunk form.

Norway Maple is widely planted in the East and on the West Coast. In the Pacific Northwest it is a useful shade tree that grows somewhat more slowly and is somewhat smaller at maturity than Bigleaf Maple. In the Rocky Mountains the species is suited to high plateaus but is not recommended for the Gila River drainage. Because it has proved to be too subject to injury from cold weather in some localities in the Rocky Mountains, it is advisable to consult local authorities about its hardiness. In the Rocky Mountains it is less subject to snow damage than Silver Maple. The species is satisfactory in interior and mountain valleys in California. Norway Maple is useful in Idaho and is hardy in most of Montana. It will grow with 20 inches of water but in the northern Rocky Mountains irrigation should be stopped by about the middle of August.

In one hurricane many Norway Maple trees in Rutherford, New Jersey, were destroyed. Their shallow roots gave them less firm anchorage than trees with deeper roots. Nevertheless the Norway Maple is generally resistant to damage by wind and ice storms. It is suitable for planting near the seashore. In the Northeast vertical cracks in the bark and wood of the trunk result from freezing. The wood is strong but not durable in contact with moist soil.

Bougainvillea Culture*

JOHN POPENOE**

Bougainvilleas are natives of South America and are members of the four o'clock family or NYCTAGINACEAE. They are grown for the showy bracts which enclose the flowers, not for the flowers as such. Bougainvilleas are named after the French navigator Louis A. de Bougainville (1729-1811) who discovered these plants in Rio de Janeiro, Brazil. The name of the plant was originally spelled buginvillea, but the spelling has now been changed to agree with the spelling of de Bougainville. Bougainvilleas are grown in Florida, South Texas, Southern California, Hawaii, and throughout the tropics of the world.

Although nineteen or more species are known, only two are commonly grown. *Bougainvillea spectabilis* Willd., has purple flower bracts and thorny stems. The other species is *Bougainvillea glabra* Choisy, which has less thorny stems and rose-red flower bracts. In addition to these two species there are many intermediate forms in many colors. Many of these forms are distinguished as botanical varieties and some as horticultural varieties.

Bougainvilleas are propagated from hard wood cuttings. Medium diameter stem sections six to twelve inches long make the best cuttings. They can be taken any time during the year but the best time is probably in late spring or early summer after the vines finish flowering. Cuttings can be made conveniently during this period because it coincides with the time of heavy pruning. The cuttings can be rooted in sand or other media. Some varieties are more difficult to root than others and should be rooted under mist. With these more difficult varieties, commercial rooting hormones are beneficial. The length of time necessary to develop roots on cuttings may be as long as two months. Bougainvilleas do not ordinarily make seed under conditions prevailing in the United States.

Although bougainvilleas thrive on neglect, they generally need to be fertilized and watered to become established. Young plants in Florida should be fertilized regularly with a complete fertilizer, such as 6-6-6-3 mixture (6% nitrogen, 6% phosphate, 6% potash, and 3% magnesium oxide). This should be applied several times during the first year. A quarter pound of this mixture per plant per application should be adequate. Established plants should be fertilized only in late spring and summer. If fertilizer is applied after September or October there is likely to be vegetative growth and little flowering.

In Texas and California, soils are generally richer than in Florida and nitrogen may be the only fertilizer element required. Sometimes bougainvilleas develop a chlorosis in spite of being fertilized with a complete fertilizer. This may be caused by a minor element deficiency. Manganese deficiency has been identified on bougainvilleas. Most minor element deficiencies can be corrected by sprays on the foliage. Minor element sprays containing manganese, copper, and zinc are commercially available and instructions on the label should be followed. Iron chlorosis, if found, can be controlled by applying chelated iron to the soil.

Bougainvilleas can be grown in almost any soil and are moderately salt tolerant for areas along the sea coast. They are among the most beautiful plants grown on the Florida Keys. Some of the varieties can be trained as shrubs, while others grow vigorously and must be allowed to climb on a trellis or other support. They do best when planted in full sun and will do poorly if the shade is very dense. Established plants need to be pruned. The climbing types (as indicated on the variety list) need to be pruned to stay on the trellises provided for them. Sometimes they are allowed to climb up into a large tree and then very little pruning is needed. The bush types need to be pruned to maintain good shape. Some of the varieties, including

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J. C. NOONAN

Bougainvillea 'Betty Hendry' trained on a trellis to serve as a screen

the bush types, are well adapted to hedging. Pruning of all types should be done after flowering and during the summer. Pruning after September and during the flowering season will greatly reduce the amount of bloom obtained. Frequent light pruning or pinching out of growing tips is often the best way of maintaining the bush types.

Comparative freedom of bougainvilleas from serious diseases and insect pests makes their culture easier than with many plants. This factor is of importance where widespread plantings are made and it encourages increased planting.

The bougainvillea caterpillar, *Asciodes gordialis* Guen., is the most common pest of bougainvillea in Florida. It feeds on the leaves and sometimes on the flowers. The larvae are difficult to observe because they are green and blend in with the leaf colors. The larvae spin silken threads which tie the leaves together and then they feed within this enclosed area. Other leaves are rolled around the larvae. The adult is a light tan colored

moth. Partially eaten leaves and leaves rolled and tied together give plants an unsightly appearance. Some varieties are attacked more severely than others. These insects can be controlled with lead arsenate or DDT. Several of the newer insecticides should also give good control. Instructions on the labels of these insecticides should be followed. Repeat applications may be needed after three or four weeks, especially when the plants are growing rapidly. Heavy fertilization of the plants is likely to be followed by rapid plant growth and possible increase in infestations by the insect.

A powder post beetle, *Amphicerus cornutus* Pallas, has been serious in some bougainvillea plantings on Key Largo, Florida. Beetles burrow into the larger parts of the plants, starting in the crotches of twigs and branches. Burrows are about three-eighths inch in diameter and may extend several inches in length. A drench, wetting the larger branches and stems with BHC (Benzene hexachloride) or lindane is recommended for control. A second application should be made three weeks after the first.

***Bougainvillea parviflora* trained as a shrub at the entrance to a house**

J. C. NOONAN





*Flowering
branch of
**Bougainvillea
glabra**
'Crimson Lake'
displaying
showy bracts
enclosing
small pairs of
flowers*

*Outstanding
specimens of
bougainvillea
trained as
standards
Hope Gardens
Kingston
Jamaica*



W. H. HODGE

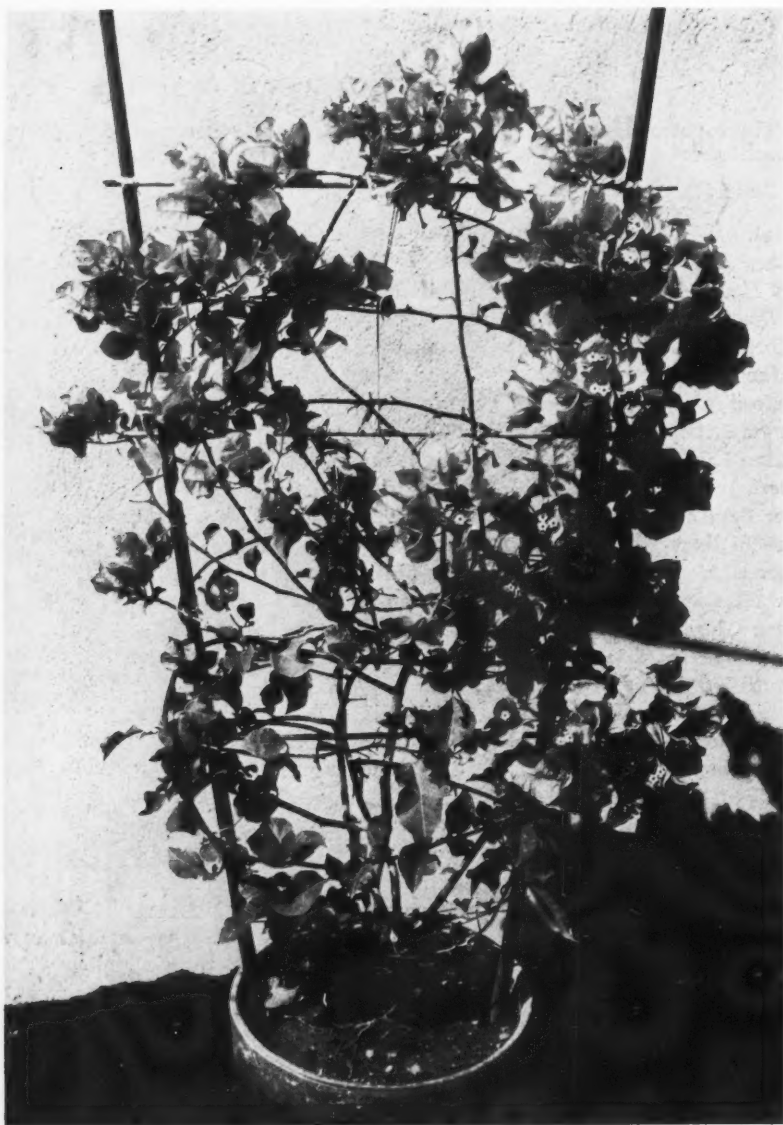
Species and Varieties

The following is a partial list of Bougainvilleas grown in the U. S., their colors and form.*

Variety	Color**	Form
Afterglow	yellow-orange	climber
Barbara Karst	bright red	bush or weak climber
Betty Hendry	pinkish red	climber
<i>brasiliensis</i> (same as <i>spectabilis</i>)		
California Gold	golden-yellow	-----
Cienfuegos	wine-rose	-----
Crawford's dark purple seedling	true-purple	-----
Crimson Lake	bright red	climber
Crimson Lake, Jr.	bright red	bush
<i>cypheri</i>	crimson	climber
Easter Parade	pale lavender	climber
Elizabeth Doxy	white	-----
Encore	rosy-pink	bush
Firecracker	bright red	-----
Golden Glow	yellow	-----
Harrisi (variegated leaves)	purple	climber
Harvard No. 1	rose	-----
<i>lateritia</i>	brick-red	climber
Mallow Purple	light purple	-----
Maud Chettleburg	dull magenta-purple	-----
Moonlight Madonna	white	climber
Mrs. Butt	amaranth-purple	climber
Mrs. Richard Pope	purple	climber
Orange Sport	spinel-pink	-----
Panama Pink	mauve-pink	-----
<i>parviflora</i> (everblooming)	purple	bush or weak climber
Purity	white	weak climber
Rosalane	apricot-orange	climber
<i>sanderiana</i>	crimson	bush or weak climber
San Diego	crimson	climber
Scarlett O'Hara	red	climber
<i>spectabilis</i>	deep red-purple	climber
Temple Fire	brilliant red	bush
<i>variegata</i> (variegated leaves)	purple	climber

*Many nurseries sell bougainvilleas only by color.

**Colors are taken from various descriptions, including those in nursery catalogs.



G. HAMPFER

Bougainvilleas make attractive pot or tub specimens for patio, garden or conservatory. Bougainvillea \times buttiana "Poultoni" illustrated.

The Seed Collection

United States Department of Agriculture

PAUL RUSSELL*

The seed collection of the United States Department of Agriculture, located at the Plant Industry Station, Beltsville, Maryland, is, I believe, the only large general seed collection in the world, that is, the only one that includes samples of all the important plant families, ranging in size from the dust-like seeds of the orchids to some that are too large to be placed in any glass container or herbarium case. The total number of samples of seeds and seed-like fruits is approximately 60,000, in addition to a considerable number of dried fruits of various sizes that supplement these seeds. There is also a large specialized seed collection at the Agricultural Research Center, Beltsville. This consists chiefly of seeds of actual and potential weeds and crop plants, and is used mainly in carrying out the provisions of the Federal Seed Act.

A large proportion of the plant material introduced from abroad by the Department of Agriculture is received as seeds. It is therefore important to confirm the identity of these seeds as soon as they arrive; and to identify, if possible, any that arrive without botanical names. If this can be done, it makes possible a prompt and more intelligent placing of the seed material for testing, usually at one of the Department's plant introduction field stations. Utilization of the large general seed collection already mentioned is, of course, the chief means for such identifications.

Like a large reference library, this seed collection is open to anyone who cares to consult it, and for many years it has been so used.

The idea of a general seed collection appears to have originated with Homer C. Skeels, who started such a collection in 1908 while on the staff of the Office of Taxonomic and Range Investigations, Bureau of Plant Industry. He continued in charge of the collection in this and

other agencies until his death, early in 1934. An interesting paper on this collection was published by Mr. Skeels in *The National Horticultural Magazine*, October, 1932.

The first recorded introduction, of which a seed sample was kept, was a variety of cabbage received from Russia in February 1898. (P.I. No. 3) Apparently seed samples of introductions were kept in some temporary fashion until early in 1908, when the general seed collection was established.

For a few years a sample of each seed introduction was placed in the collection, but eventually space limitations made it necessary to retain only enough samples of crop plants and other frequently introduced species to show as many variations as possible.

By this date, June 1961, approximately 275,000 introductions have been made, of which about 70 per cent were received as seeds.

Of the 299 plant families included in the Engler and Prantl Classification System, 251 are represented in the collection. The number of distinct species is now about 17,000.

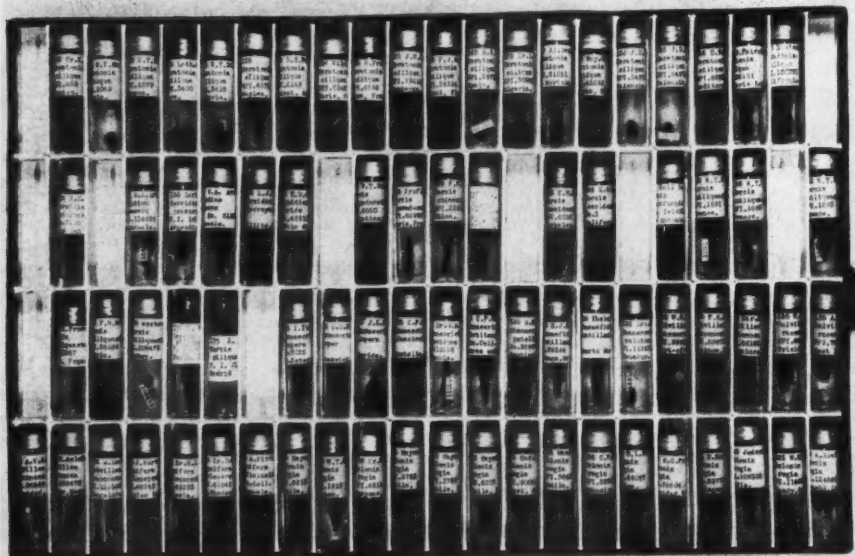
The size of the sample determines the size of the glass vial or jar in which it can be filed. By far the greatest number of samples are in vials that measure $\frac{5}{8}$ -inch in diameter. Others are in vials or small jars that measure $\frac{7}{8}$ -inch, $1\frac{1}{4}$ -inches, $1\frac{3}{4}$ inches or $2\frac{1}{4}$ inches in diameter, all with metal caps. Specimens, mostly fruits, that are still larger are filed in black, cardboard boxes of various sizes.

Each of these series of containers is filed by families arranged according to the Engler and Prantl system, with the genera and species arranged alphabetically within each family.

There is a very remarkable range in the size of the seeds, varying from the smallest, represented by the almost powdery seeds of some of the orchids, or the minute (.008 in.) seeds of the witchweed (*Striga asiatica*), to the huge seeds of the palm known as the *Coco de Mer*, or double coconut (*Lodoicea maldivica*), native

*Before his retirement in 1960, the author served for many years as Botanist in charge of the seed and fruit collection of the U. S. Department of Agriculture, Agricultural Research Service, Crops Research Division, Beltsville, Maryland.

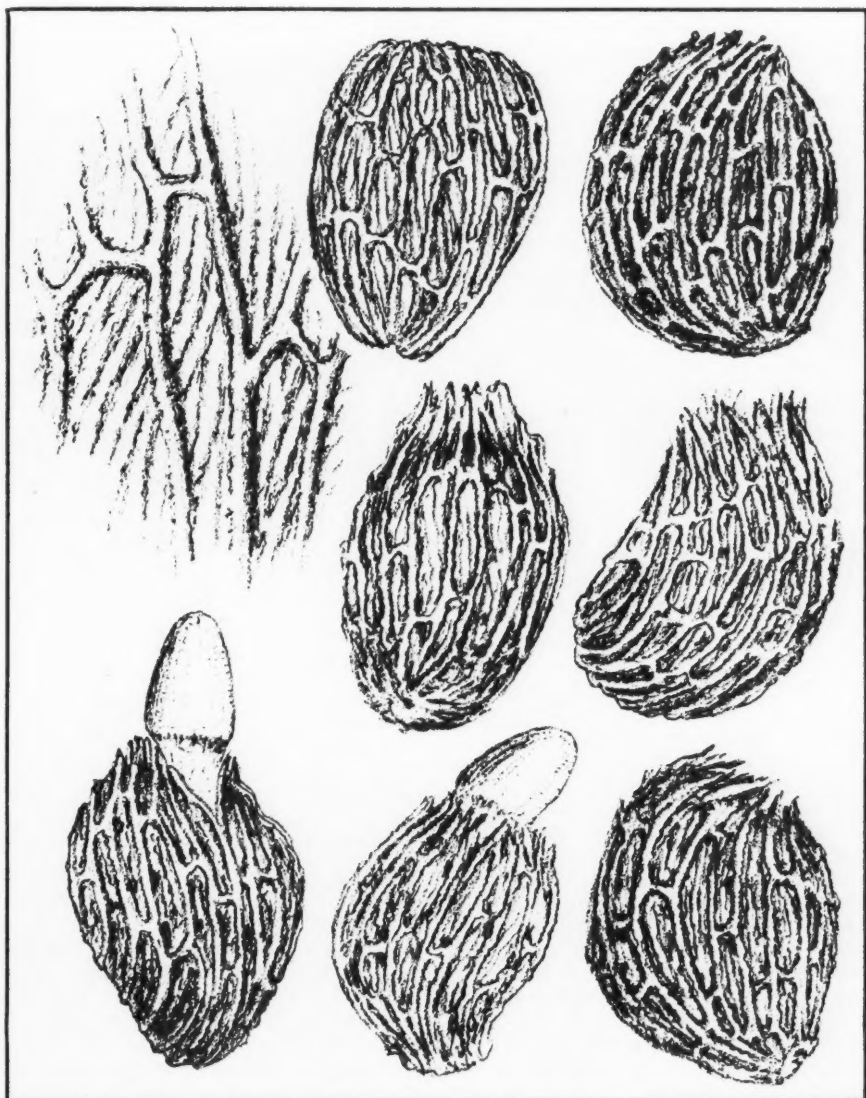
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Most samples are filed in small glass vials as shown in the tray above. Others are in cardboard boxes of various sizes. The largest sample, *Lodoicea maldivica*, shown below, rests atop a herbarium case.



U. S. DEPARTMENT OF AGRICULTURE



U. S. DEPARTMENT OF AGRICULTURE

REGINA O. HUGHES

The smallest seeds known may be those of the recently introduced parasitic herb known as the witchweed, *Striga asiatica*. These are only $1/5$ mm. (.008 inch) long. One plant may produce fifty to five hundred thousand seeds. The witchweed, native to Old World tropics, attacks corn, sorghum, sugarcane, and other grasses.



MELOCANNA BACCIFERA

U. S. DEPARTMENT OF AGRICULTURE

The fruit of the bamboo, Melocanna baccifera, is the largest in the family of the grasses.

to the Seychelles Islands in the Indian Ocean. These two-lobed seeds are sometimes a foot in diameter, and when fresh may weigh as much as fifty pounds; they are too large for any standard container, and the one specimen in the collection rests on top of a herbarium case.

Not all the samples represent accessioned introductions. A small percentage, from various sources, has been included for reference purposes. These are seeds and seed-like fruits from herbarium collections, botanical gardens, and various collectors throughout the world.

A complete card catalog of the specimens arranged alphabetically by genera and species is maintained; this is incorporated with the general index to all the introductions made since the beginning of the plant introduction project in 1898.

Certain of the plant families represented deserve special considerations because of their size and importance.

Grass Family

From the economic point of view, the grasses (POACEAE) are the most important family of plants. It is therefore not remarkable that seed samples of grass introductions occupy about one and a quarters cases of the $\frac{5}{8}$ -inch vials, and sections also of cases of the $\frac{7}{8}$ -inch and $1\frac{1}{4}$ -inch sizes. More than 280 genera of grasses are represented. Most of the grass seeds (caryopses) are rather small, but a few larger ones such as the large-kernelled Cuzco (Peru) corn require $\frac{7}{8}$ -inch vials. Also, one species of bamboo (*Melocanna baccifera*) from India, has obovoid-conical seeds up to 4 inches long and 2 inches wide. Included also are the hard, shining gray, ellipsoid seeds of the grass known as Job's tears, sometimes used in the tropics as beads and for rosaries; a soft-seeded form is eaten like rice in the Philippines. The several thousand spe-

cies of grasses include not only the well-known grains (wheat, corn, rice, oats, etc.) but also a very large number of forage plants.

Pulse Family

The pulses or legumes (LEGUMINOSAE) are a close second to the grasses in economic importance. Here are found many of the staple foods of the world, such as common and oriental beans, peas, and soybeans, and of course many important forage plants like alfalfa, sweetclover, vetches, and numerous clovers. The number of genera of the legumes in the seed collection is 270, nearly as many as those of the grasses.

One very interesting legume is *Dimorphandra megistosperma*; this is a large timber tree from Panama and has probably the largest dicotyledenous seeds known. These are roughly kidney-shaped and measure up to about 7 inches long and 4 inches wide.

Rose Family

A large proportion of our well-known edible fruits, such as the apple, peach, cherry, and plum, belong to the rose family (ROSACEAE). This family also includes many of our most popular ornamentals like the roses, flowering cherries, and crabapples. While there are only 86 genera of ROSACEAE included in the seed collection, the number of species, especially in such genera as *Rosa*, *Rubus* and *Prunus*, is rather large.

Other Families

There are, of course, other families less impressive because of size, but nevertheless of great importance. Such are the rue family (RUTACEAE), including the citrus fruits; the cabbage family (BRASSICACEAE); and the gourd family (CUCURBITACEAE), including pumpkins, squashes, and melons. The economic importance of these is reflected in the large number of samples in the seed collection.

Some families are represented by only two or three genera, and a few by only one sample, such as the NAIADACEAE, RAPATACEAE, SCYTOPETALACEAE, and MARCGRAVIACEAE. These, as well as some families entirely absent, are of little or no economic importance.

A survey of the collection, outside of the few families already considered, discloses a number of genera and species of special interest because of color, shape, surface characters, or some other reason.

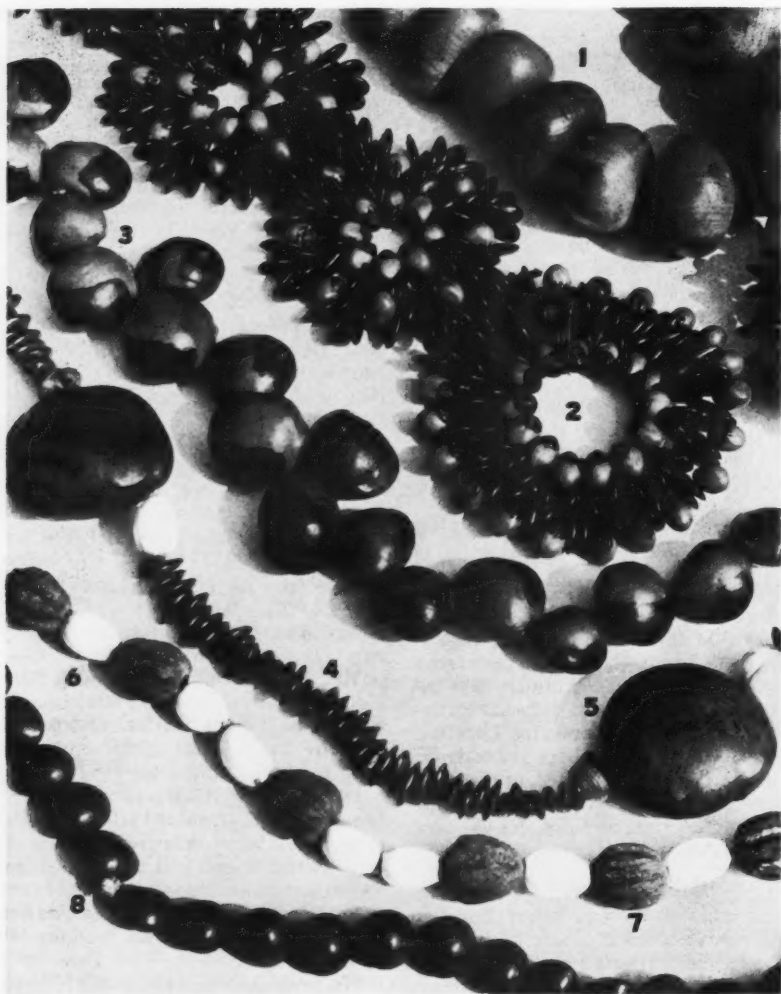
Color

One of the first impressions gained from looking over a large general collection of seeds is that so many are brownish, grayish, or black. But a further search will reveal that all, or nearly all, colors appear. In some varieties of corn, for instance, the kernels run just about the entire gamut of colors, including some colors very uncommon among seeds. In somewhat the same category are varieties of the common bean (*Phaseolus vulgaris*), with a very wide assortment of colors, ranging from pure white through yellow, brown and reddish brown to purplish and black. The same is true of the lima bean (*Phaseolus lunatus*). In neither of these last two groups, however, are there any of the true primary colors.

Among the more interesting colored seeds are those of two species of *Ravenala*, because of the silky aril that partly covers the seed. That of the Madagascar Traveler's Tree (*R. madagascariensis*) is bright blue, whereas the aril of the South American counterpart (*R. guyanensis*) is bright scarlet. The woolly aril of the seeds of one of the South African bird-of-paradise flowers, (*Strelitzia alba*), is likewise bright scarlet, at least when they are fresh. Both of these genera belong to the banana family (MUSACEAE).

Deep-blue seeds are produced by the blue cohosh (*Caulophyllum thalictroides*), a barberry relative from the eastern United States, and also by a legume, an undetermined species of *Rhynchosia* from Kenya. Blue kernels may be found in some corn varieties, such as one found in Guatemala.

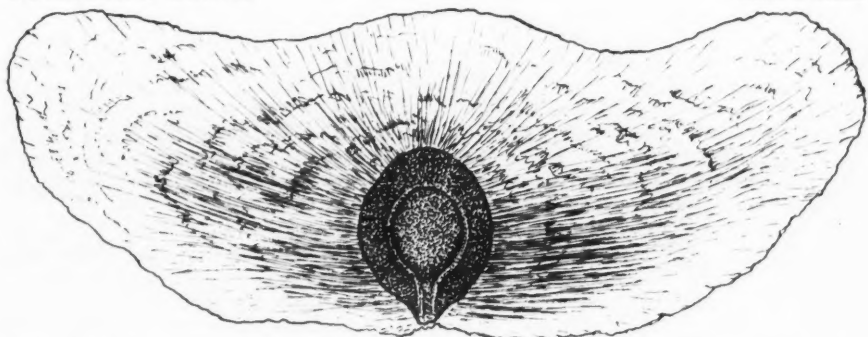
Half-red and half-black seeds have always had a strong popular appeal, and have been commonly used as beads and necklaces. One of the best known of these is the tropical Asian rosary-pea or crab's eye (*Abrus precatorius*), now widely distributed throughout the American Tropics. The small, bright-scarlet and blacks seeds, with the hilum or seed scar in the black part of the seed, though deadly poisonous if eaten, are made into necklaces or mats and sold throughout the Tropics of both hemispheres. The *pega palo* (*Rhynchosia pyramidalis*) of Hispaniola, a plant that recently was publicized because of the alleged rejuvenating power of an infusion of its roots, also has very similar red and black seeds, but in this genus the hilum is located in



Seeds of a number of tropical plants are widely used as beads in necklaces, mats, or in rosaries. Above (1) are gray nickars (*Caesalpinia bonducella*); a mixture (2) of red-and-black crab's eyes (*Abrus precatorius*) and dyed-black seeds of *Leucaena leucocephala*; (3) large red-and-black seeds of the necklace tree (*Ormosia monosperma*); (4) brown seeds of *Leucaena leucocephala*; (5) one type of "sea bean," (*Mucuna urens*); (6) bluish gray job's tears (*Coix lacryma-jobi*); (7) the blackish china-berry (*Melia azedarach*); and (8) the scarlet coral-bean (*Adenanthera pavonina*).

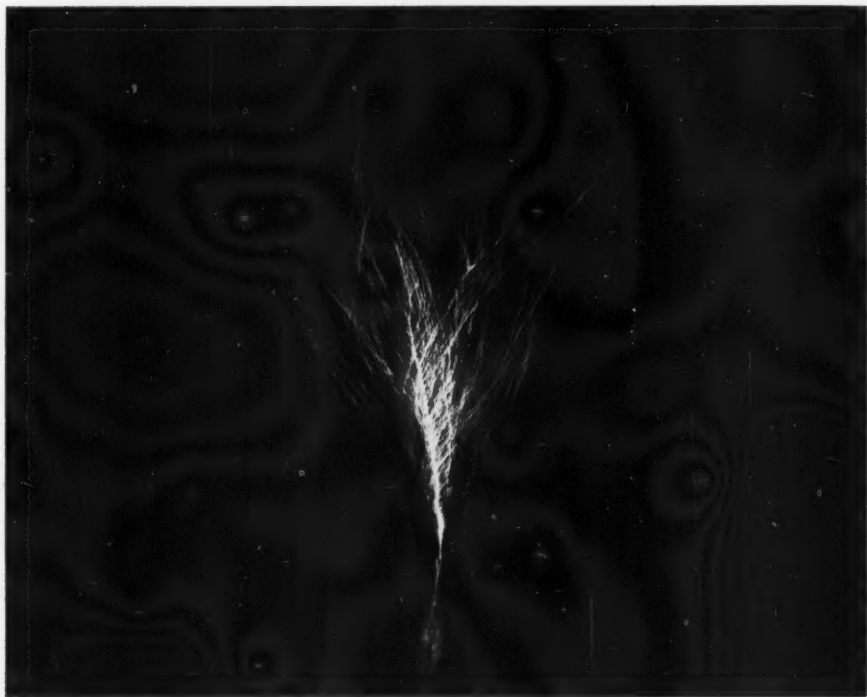
U. S. DEPARTMENT OF AGRICULTURE

REGINA O. HUGHES



One of the most remarkable winged seeds is that of an East Indian cucurbit vine (*Macrozamia macrocarpa*) with a flat seed one inch across, and a wing at each end about three inches long and two wide. Commonly called the airplane seed since it describes a spiral about twenty feet wide when falling from the high-climbing vine.

The species of *Strophanthus* from tropical Asia and Africa have seeds that resemble the dandelion seed, with a long, slender beak that is densely feathered with fine hairs along the upper half. From the seeds of certain species (*Strophanthus gratus*, illustrated), sarmenogenin is derived; this contributes to the synthesis of cortisone, a possible remedy for arthritis.



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the red portion of the seed. Similar to these are the handsome red-and-black ovoid seeds of the West Indian *Ormosia monosperma*, about half and inch long, often used as watch charms.

Red seeds are not uncommon. The dark-red form of the West Indian sword-bean (*Canavalia gladiata*) is a well-known example. Seeds of some varieties of the common bean (*Phaseolus vulgaris*) range from pinkish to dark red, and two oriental species of *Phaseolus*, the adsuki bean (*P. angularis*) and the rice bean (*P. calcaratus*), have garden varieties with maroon seeds. The bright-red, lens-shaped seeds of the bead tree of tropical Asia (*Adenanthera pavonina*) have been used by jewelers as a standard of weight because each seed weighs almost exactly 4 grains. In the West Indies, where the bead-tree has been naturalized, the seeds are very popular for making mats and necklaces.

A good example of clear-gray seeds are those of the West Indian knickernut (*Caesalpinia bonducella*); these are rounded-ellipsoid and about $\frac{3}{4}$ inch long. Seeds of some varieties of the common bean, as well as a few species of the velvet-bean (*Stizolobium* spp.), also are gray.

Clear-green seeds are represented by a very well-known oriental bean (*Phaseolus aureus*), the mung bean of commerce.

Perhaps the most attractive seeds, from the color standpoint, are those in which two or more colors are intermingled by marbling or mottling. Castor beans (*Ricinus communis*) furnish an excellent example; another is seeds of the Pará rubber tree (*Hevea brasiliensis*).

Seeds with smooth, very shiny surfaces, found in a number of families, are conspicuous in a collection. The well-known lamb's-quarters (*Chenopodium album*) has small, black, very shiny seeds. Other good examples, also with black, shiny seeds, are *Pithecellobium grandiflorum* (LEGUMINOSAE) and *Dodonaea hexandra* (SAPINDACEAE), handsome tropical trees and shrubs.

Shape

Perhaps the most common shapes encountered in seeds are more or less subglobose or ovoid, but there is almost no limit to the range in shape in a large collection. For example, seeds of some species of indigo (*Indigofera*) are miniature cubes. Many of the genera of MENISPER-

MACEAE have hippocrepiform, or horse-shoe-shaped, seeds. This type of seed also occurs in the mignonette family (RESIDACEAE) and in species of *Ternstroemia*, tropical evergreen shrubs and trees. Many people are familiar with the lens-shaped seeds of the lentil (*Lens culinaris*) and the brown, shiny, ellipsoid-flattened seeds of flax (*Linum usitatissimum*).

The common bluets (*Houstonia caerulea*) and other species of *Houstonia*, have curious cup-shaped (acetabuliform) seeds; some species of speedwell (*Veronica*), also a few species of navelwort (*Omphalodes*), attractive annuals and perennials of the borage family show the same structure.

The monkey-puzzle tree of Chile (*Araucaria araucana*), cultivated in the warmer portions of the United States, has chestnut-brown wedge-shaped seed-like scales nearly 2 inches long; the short, crescent-shaped seeds of the well-known cashew nut (*Anacardium occidentale*) have an odd, monkey-like appearance. The large reddish brown cola nut (*Cola nitida*), source of cola used in numerous soft drinks, resembles the lobe of a chicken liver.

One species of *Eucalyptus* (*E. calophylla*) has seeds that bear a striking resemblance to miniature Eskimo kayaks, with a light-colored spot where the paddler might sit.

A small gourd from the Himalayas (*Trichosanthes himalensis*) has most remarkable cylindrical seeds; each one appears to have a belly-band around its middle. Seeds that are decidedly flat are especially common among monocotyledons. Well-known examples are seeds of *Lilium*, *Tulipa*, *Yucca*, and *Agave*.

Snail-shaped (cochleate) seeds are found in a few families. Good examples are the MELASTOMACEAE, a family of mostly tropical trees and shrubs, and the COCHLOSPERMACEAE, also tropical and woody. A slight change in the cochleate shape becomes kidney-shaped or reniform; seeds of this form are found in many families, such as the pink family (SILENACEAE), the mallow family (MALVACEAE), and the potato family (SOLANACEAE).

Surface Characters

An interesting seed character of certain genera is the presence of hairs on the surface. These may occur as a short tuft or coma attached to the end of the seed, as

in the milkweed family (ASCLEPIADACEAE), the dogbane family (APOCYNACEAE), and the tamarisks (*Tamarix* spp.). Or the hairs may cover the entire seed, as in most species of cotton (*Gossypium*), kapok (*Ceiba*), and milkwort (*Polygala*). Some hairy-seeded species of morning glory (*Ipomoea*) closely resemble cotton seeds, so much so, in fact, that occasionally they have been confused.

There are also certain genera where the seed itself is not hairy, but is connected by a slender stem with a feathery appendage, designed to float in the wind. Some grass seeds, like needlegrass (*Stipa*), and seeds of *Strophanthus* (APOCYNACEAE) are thus equipped. Seed-like fruits, also, like those of the dandelion (*Taraxacum* spp.) are very similar, with a very slender beak supporting the large pappus.

The surfaces of some seeds or seed-like fruits are specially adapted to aid in their dissemination. The seed coats of one of the plantains (*Plantago fastigiata*) and also a number of species of butterfly-pea (*Clitoria*) are so viscid that they are easily attached to the hair of passing animals. There are several other species and genera whose seeds possess viscosity, such as the garden cress (*Lepidium sativum*), alfalfa (*Erodium cicutarium*), and some species of flax (*Linum*), *Peperomia*, pepper (*Piper*), and rush (*Juncus*).

One of the commonest methods by which plants disperse their seeds is through various types of wings, by which the wind carries the seeds often for great distances. Some of the best-known seeds of this type are in the pine family (PINACEAE), such as most of the pines, the spruces and firs, with samaroid seeds resembling the so-called seeds (keys) of the maples, which botanically are fruits.

The popular crape myrtle (*Lagerstroemia indica*) also has samaroid seeds, which are rather small; in several other less-known genera this same type of seed occurs.

The large genus *Dioscorea* (true yams), with more than 60 species in the collection, has winged seeds. In most cases the seed is winged on both sides and the wings are thin and papery.

Nearly all the genera of the bignonia family (BIGNONIACEAE) have flattened seeds, with wings on both ends, sometimes even surrounding the seed. The large genus *Rhododendron* (ERICACEAE), of which there are several hundred species in the collection, has thin, flat seeds, usually winged all around.

Probably the largest winged seed known is that of *Macrozanonia macrocarpa*, a high-climbing cucurbit vine native to Java; the seed is about 1 inch across, with a wing on each side about 3 inches wide. This has been called the airplane seed, since it describes a spiral about 20 feet wide when falling to the ground. It has been studied by aeronautical engineers interested in possible adaptation of its shape to airplane or glider wings.

In general, one may expect to find examples of winged seeds among all sizes of seeds, including those scarcely $\frac{1}{4}$ inch across, among the orchids.

If seed-like fruits in the collection are also considered, several with wings could be cited. Most plants with winged fruits are either trees or lofty climbers. The maples (*Acer* spp.), the ashes (*Fraxinus* spp.), the elms (*Ulmus* spp.), and the birches (*Betula* spp.) are well known for their winged "seeds." Several tropical genera of legumes represented have winged fruits varying greatly in size and shape, from nearly orbicular (*Pterocarpus indicus*), to elongate and samaroid, and in size from about 1 inch across to the large 6-inch long pod of *Centrolobium paraense* that strongly resembles a huge maple key.

In this group there are several equipped with bristles or hooked spines, designed to aid in their dispersal. Only a few of these such as the tick-clovers (*Desmodium* spp.), the beggar-ticks (*Bidens* spp.), and the agrimonys (*Agri- monia* spp.), need be mentioned.

If any of our readers are seeking an interesting and profitable hobby, a collection of properly identified seed samples could be the answer, especially for those working with little-known groups of plants grown from seeds.



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Figure 1. *A grove of Phyllostachys pubescens near Kyoto, Japan.*
Most of the culms in this grove are 10 to 15 cm. in diameter

A Unique Ornamental Bamboo

ROBERT E. PERDUE, JR.,
and JOHN L. CREECH*

Most bamboos are characterized by tall slender segmented culms with very distinct horizontal nodes (Fig. 1). Although many abnormal culm forms are described in the bamboo literature, these are largely of passing interest for most appear only rarely and when transplanted do not vegetatively reproduce their type. Among the curious culm forms that have appeared is a bizarre form of the edible bamboo, *Phyllostachys pubescens* Mazel ex H. de Leh. (*P. edulis* H. de Leh.) (Figs. 2-4). The lower nodes of this unique bamboo are arranged obliquely rather than horizontally. The leaves and upper section of the culm are typical of *P. pubescens*, but the ultimate height is greatly reduced.

According to all available information from China, the original home of *Phyllostachys pubescens*, the bizarre form appears rarely in normal groves. When rhizomes bearing the bizarre culms are excavated and transplanted, they produce only normal culms. In Japan, where bamboos are widely cultivated for their utilitarian as well as ornamental value, both authors visited small groves near Kyoto in which the bizarre form was well established and reproducing its type. Here, this bamboo is esteemed as an ornamental and culms from some groves are marketed.

Six plants of this bamboo with oblique nodes were purchased by the U. S. Department of Agriculture in 1931 from the Yokohama Nursery Company and introduced into the United States as P. I. No. 93224. One of the plants survived in the Garbour Lathrop Plant Introduction Garden at Savannah, Georgia, until the early 1940's but failed to produce new culms. No other introduction was attempted since all available information indicated that the plant was a rare freak and incapable of reproducing it-

self. Now that the ability of the plant to reproduce vegetatively is recognized, a new effort will be made to introduce this form into the United States. If it is successfully introduced, it will provide an interesting addition to American horticulture. It should be well-adapted to the environment of the southeastern states.

The lowermost internodes of normal culms of *Phyllostachys pubescens* are about as long as the diameter of the culm (Fig. 1). The 7th and 8th internodes and those above are 2 to 3 times as long as the diameter of the culm. Normal culms attain heights as great as 25 m.

The nodes of the bizarre forms (Figs. 2-4) are arranged obliquely in zig-zag fashion, each merging or nearly merging on one side of the culm with the node below and on the opposite side with the node above. In many culms each node forms a right angle with the nodes immediately above and below. Alternate nodes are parallel. The septa follow the alignment of the nodes. They are usually complete but in some culms are not continuous with the wall at the upper part of the node and thus do not completely separate the internodal chambers. The distorted internodes of the lower part of the culm are reduced in length and because of the oblique continuous arrangement of the nodes, are asymmetrical. On one side of the culm they are less than 1 cm. long or may be indistinguishable; on the opposite side of the larger culms, they are 8 to 12 cm. long. The long dimension of the internode is about 1.5 times as long as the diameter of the culm.

Cells of normal internodes are longer than those of abnormal internodes. Takenouchi (6)** found that the average length of cells from a normal internode 11.6 cm. long was 80 microns. The average lengths of cells from abnormal internodes 1.6 and 2.8 cm. long were 21 and 22 microns, respectively.

Rhizome buds of phyllostachyoid bamboos initiate development during fall

*Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland. The writers acknowledge with appreciation courtesies extended to each, during separate trips to Japan, by Dr. Koichiro Ueda, Professor of Forestry, Kyoto University, Director of Kamigamo Experimental Forest of Kyoto University, and Japan's outstanding authority on bamboo forestry.

**See References cited at end of paper.



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Figure 2. A small commercial grove of Buddha's face bamboo (*butsumen-chiku*) near Kyoto, Japan. The normal culm in the foreground is a length of *Phyllostachys bambusoides* used here as a prop.

and become greatly enlarged during the following winter. During this period, the nodal-internodal arrangement that will be expressed in the culm to be produced during the following spring, becomes completely or almost completely differentiated. Swollen buds of the bizarre type collected just before they elongate and appear above the surface of the soil, when split longitudinally, show the distorted arrangement of the nodes and internodes in "embryonic" form. A longitudinal section of such a young bud is illustrated by Takenouchi (6). This illustration shows a number of abnormal septa near the base of the bud. The upper septa are normal.

The basal diameter of the obliquely noded culms is 6 to 12 cm. The distorted nodes and internodes, restricted to the lower .4 to 2 m. of the culm, may number from as few as 4 to as many as 36. The nodes and internodes of the upper part of most culms are normal. Between the lower completely distorted section of the culm and the upper normal section may occur a transitional area where the nodes are only partly distorted

or where several nearly normal internodes are separated by single distorted internodes. The lower axes of the culms are usually vertical; the upper axes, where nodes are normal or nearly so, are often oblique. The change in direction of the axis is especially pronounced where a completely normal internode is adjacent to a distorted node, less pronounced, sometimes almost unnoticeable where the transition from abnormal to normal nodes is gradual. Most of the unique culms are 3 to 6 m. tall but culms up to 13 m. are recorded in the literature. The abnormal culms are more strongly tapered from base to apex than are normal culms.

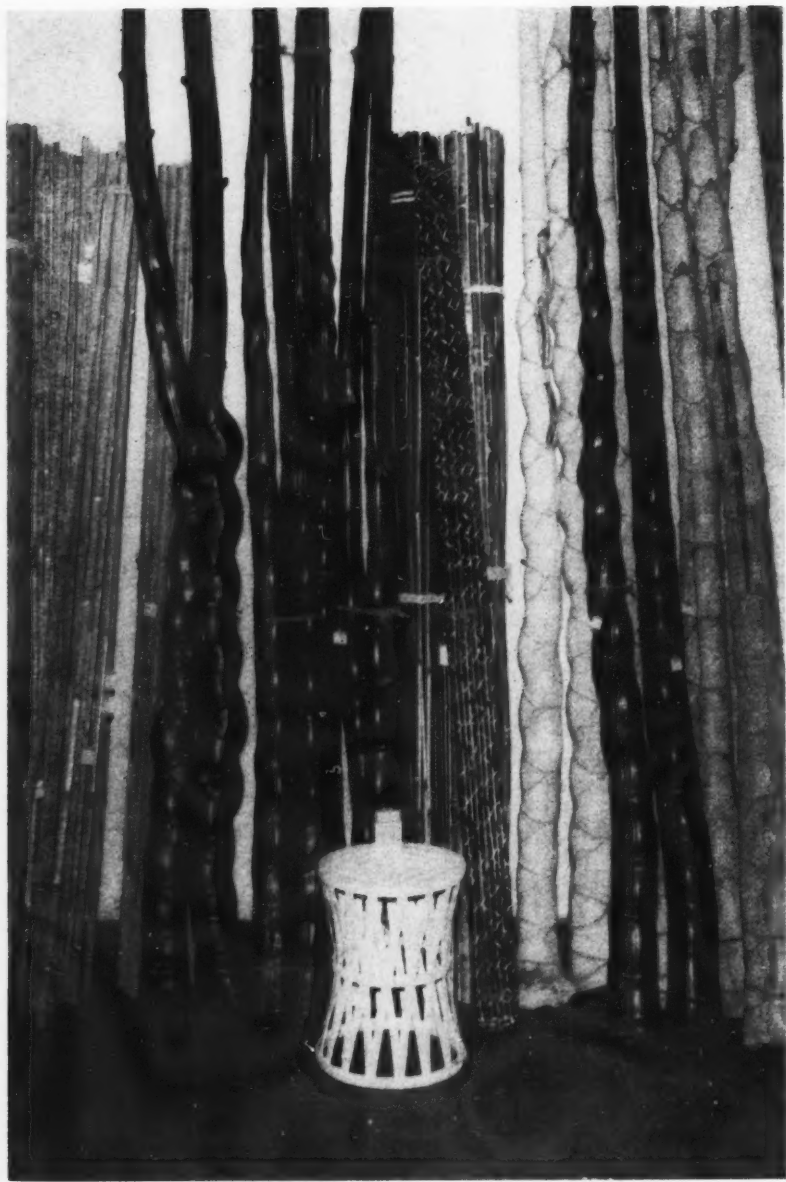
Apparently, because of stresses set up by the unequal length of internodes on opposite sides of the culms, the lower abnormal nodes are commonly weaker than normal nodes and are easily broken by heavy wind. Growers reduce the risk of wind damage by cutting off many branches and the upper parts of the culms.

The Japanese distinguish two forms of the obliquely noded bamboo on the basis



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Figure 3. *A small ornamental planting of tortoise-shell bamboo (kikko-chiku) in a farmer's garden in Saitama Prefecture, Japan.*



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Figure 4. *Natural and artificially stained culms of Buddha's face bamboo on display in a Tokyo department store. The package of cigarettes on the stand in the foreground is 5.7 cm. wide.*

of the shape of the internodes. The long dimension of the internodes of the Buddha's face bamboo (butsumen-chiku) (Fig. 2) bulges conspicuously. In contrast, internodes of the tortoise-shell bamboo (kikko-chiku) (Fig. 3) do not bulge; the culms are nearly cylindrical.

It has been presumed that the name "tortoise-shell bamboo" was adopted in allusion to the convex surface of the internodes, which in one form closely resembles the shell of a tortoise. This name is a direct translation of the Japanese name "kikko-chiku." "Kikko," Japanese for tortoise-shell, literally means "6-sided" and was adopted in allusion to the hexagonal segments characteristic of the middle portion of the tortoise's shell. The name "tortoise-shell bamboo" is not descriptive of the convex tortoise-shell-like shape of the internodes but alludes to the hexagonal appearance of the internodes, which resemble the segments of the tortoise's shell.

Buddha's-face bamboo and tortoise-shell bamboo are not to be confused with *Phyllostachys aurea* A. & C. Riv., the Hotei-chiku of the Japanese. Satow's (5) inclusion of the name Buddha's-face bamboo with his description of Hotei-chiku is incorrect. Many culms of *P. aurea* have one or more internodes near the base much reduced in length and irregularly inflated, and occasional culms have several oblique nodes. The Japanese name applied to *P. aurea* alludes to the corpulent image created by Japanese artists of the god Hotei, one of the seven Japanese gods of good luck.

The bizarre form of *Phyllostachys pubescens* is apparently very rare in mainland China, all reports referring to single culms growing in normal groves. Porterfield, who has published a large number of papers on bamboo with special emphasis on the Chinese representatives, first observed the bizarre form in 1924 after a period of residence in that country of some 6 or 7 years (4). Were the bizarre form of frequent occurrence in China it is unlikely that this unusual bamboo might be overlooked for a single culm with conspicuous oblique nodes would stand out "like a sore thumb" in a grove of normal culms in which all lines are either horizontal or vertical.

According to McClure (3), authority on the taxonomy of *Phyllostachys*, the bizarre form of *P. pubescens* does not reproduce itself although culms trans-

planted to gardens may live for many years. This observation is based on long experience in China and is in agreement with other observations made in that country. Unquestionably, the unique forms cultivated in Japan can reproduce their type by vegetative reproduction. The tortoise-shell bamboo culms illustrated in Fig. 3 were growing in a small grove established in a farmer's garden in Saitama Prefecture as an ornamental. This small grove developed from three separate propagules and each was producing culms of the bizarre type. In the illustration 8 tortoise-shell culms can be seen. Several normal-type culms were present, but their origin is not known.

Fig. 2 shows a portion of a small commercial grove of the Buddha's-face bamboo near Kyoto, from which culms are harvested for sale. This grove included many culms of the bizarre type. The tops of the culms had been cut 3 to 4 m. above the earth. The slender normal culm visible in the foreground is a length of *Phyllostachys bambusoides* Sieb. & Zucc. used as a prop. In the Kyoto area, in 1959, farmers received as much as 1000 yen for the best pieces of the Buddha's-face bamboo, equivalent to \$2.77 (U. S.).

A small planting of the Buddha's-face bamboo at Kamigamo Experimental Forest of Kyoto University provides a good example of reversion to normal-type culms. A short rhizome with culm attached, planted several years ago, gave rise to 2 new rhizomes on opposite sides. One rhizome produced obliquely noded culms like the transplant. The other rhizome produced normal *Phyllostachys pubescens* culms. Each of the new rhizomes branched and the branches continue true to type.

In the bamboo nursery at Kamigamo Experimental Forest, several small plots of the Buddha's-face bamboo have been established. Most of the culms that developed since the plots were planted in 1956 are normal. These may represent another case of complete reversion to normal or they may be "juvenile" forms produced by rhizomes that will later produce culms of the unique type.

The origin of butsumen-chiku and kikko-chiku now cultivated in Japan is not known. These forms may have been introduced directly from China but it is more likely that they arose independently in Japanese groves of normal *Phyllostachys pubescens*.

In China, where the obliquely noded bamboo is most widely known as Lohan Chu, it is highly revered and receives an honored place as an object of worship in shrines (3). It is also valued for its medicinal and magical properties. In Japan, butsumen-chiku and kikko-chiku are cultivated for their ornamental value and are used for decorative purposes. Complete culms or longitudinal sections cut through a culm are commonly used in flower arrangements or in decorative arrangements in combination with dry leaves, branches, fruits, and so forth. The culms are also used as exposed interior structural pieces in traditional-style Japanese buildings. Both forms are cultivated as ornamentals.

The unique-culm form of *Phyllostachys pubescens* was given taxonomic status as *Bambusa heterocyclus* Carr., *Phyllostachys edulis* var. *heterocyclus* (Carr.) H. de Leh., and *P. pubescens* var. *heterocyclus* H. de Leh. In Japan, in addition to the form recognized as *P. edulis* var. *heterocyclus* (butsumen-chiku), the Japanese recognize *P. edulis* var. *heterocyclus* forma *subconvexa* Makino (kikko-chiku). McClure regarded the bizarre form as a monstrosity and thus did not recognize

it when he established *P. pubescens* as the correct epithet for the plant that had been widely known as *P. edulis* (2).

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*1 not cited in text. This reference provides brief description and illustration of obliquely noded bamboo. 7 provides descriptions and illustrations of many other Japanese bamboos.

A Book or Two

Flowers and Botanical Subjects on Stamps

Shirley C. Tucker and Claude Weber, American Topical Association, Milwaukee, Wisconsin. 1960. 162 pages. Illustrated. \$6.00.

Though gardeners may not realize it, plants are second only to people as subjects on the postage stamps of the world. Over 50,000 stamps feature flowers or other plant organs as part of their design. Many of these stamps will be found listed and illustrated in this handbook (No. 30) prepared by the members of the Biology Unit of the American Topical Association, 3306 North 50th Street, Milwaukee 16, Wisconsin. Considering the problems involved in correctly identifying plants figured by artists and engravers on paper the size of postage stamps, this spiral-bound volume appears to be remarkably accurate, no doubt due to the fact that the authors are both professional botanists with university affiliations.

Since this volume is primarily for philatelists, stamps are listed first by major groups (with representatives featuring such plants as algae, fungi, ferns and seed plants) and then by the families of flowering plants which appear alphabetically. The usual details about stamps required by the collector are coded succinctly, including an indication of the part of the plant shown, as well as how featured (main design, border design, stylized design). As cross references there are indices to major family names in English and to countries.

Philatelists using this volume cannot fail to become more interested in plants in general. As for the gardener, here is a fine way perhaps to while away those winter hours with a hobby related to horticulture.

W. H. H.

Southwest Gardening

Rosalie Doolittle, in collaboration with Harriet Tiedebohl. University of New Mexico Press, Albuquerque, New Mexico. 1959, Revised Edition. 222 pages. Illustrated. \$5.00. (Library)

A book for the home gardener, especially for the newcomer to the southwest, with its alkaline soils, winds, low rainfall, and dry air.

The writing is informal, with very few technical terms. It is interesting reading which provides cultural information and the benefits of personal experience in southwestern gardening. The book gives a wide coverage of gardening,

from landscape planning through basic gardening problems to special chapters on lawns, trees, shrubs and vines, annuals, perennials, bulbs, roses, iris, houseplants, and fruits and vegetables.

A general garden calendar is provided with suggested month-by-month gardening chores outlined.

Pictures are not used in the book, but it is illustrated by means of line drawings which are effective. Definitely of value for the home gardener in the arid areas.

E. R. JENSEN

Modern Indoor Gardening

Including Window Boxes

G. F. Gardiner. Macmillan and Company, Limited, London, England. Distributed by St. Martin's Press, Inc., 175 Fifth Avenue, New York 10, New York. 1961. x+150 pages. Illustrated. \$4.50. (Library)

Recognizing the handicaps of high temperatures and low humidity in modern homes, the author has met a need for specific information on indoor culture of a wide range of plants. Some of the British terms may be unfamiliar to American readers but it is not difficult to understand their meaning.

Approximately one third of the book is devoted to clear but concise information on the care of plants indoors and describes various methods of propagation. The balance of the volume is devoted to specific information on an extensive list including the usual house plants, holiday gift plants and many tropicals which are becoming increasingly popular for use in homes and offices.

The weakest part of the book is the author's treatment of insect and disease problems of house plants. There are ninety good black-and-white photographs which are well related to the text.

VIOLET K. THOMAS

Roses—Growing for Exhibiting

Harold H. Allen. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1961. xvi + 176 pages. Illustrated. \$4.95. (Library)

Mr. Allen made a commendable contribution to all rose growers when he wrote this book. It

(Books available for loan to the Membership are designated: (Library). Those not so designated are in private collections and are not available for loan. Books available for sale to the Membership are designated with the special reduced price and are subject to the usual change of price without notice. Orders must be sent through the American Horticultural Society accompanied by the proper payment. Please allow two to three weeks for delivery. Those not designated for sale to the Membership at reduced prices can be purchased through the Society, however, at the retail prices given. In these instances the full profit is received by the Society to be used for increased services and benefits of the Membership.)

qualifies as an invaluable guide for newcomers to the enchanted world of exhibiting prize winning blooms and is a ready reference and reminder to rose growers of long experience.

As I reviewed the book, I was convinced that it is, also, an excellent presentation of facts for everyone who would experience the thrill of growing better roses to improve his home grounds.

The title suggests growing only for exhibition, but rose culture is described that would be of interest to any grower. The author tells about buying roses, preparing soil and planting, watering, fertilizing, and general care. Pruning is described with suggestions to aid in timing for a show date. Pest controls are given as well as information on mulching and winter protection.

The second half of the book is devoted to a careful discussion of the production of exhibition quality flowers and their care and handling from the plant to the show table.

Home gardeners will be encouraged and inspired by the step-by-step instructions and advice.

CHARLES C. MONTGOMERY

The complete book of
Wedding Flowers and Decorations
with a section on etiquette

Virginia Clark. Hearthsides Press, Inc., 118 East 28th Street, New York 16, New York. 1961. 160 pages. Illustrated. \$5.95. (Library)

The title tells everything! This book is really complete, although rather leaning to the more elaborate wedding.

There are some excellent line drawings which can be most helpful, and the index is quite good, enabling one to turn immediately to the phase interested in at the time.

A word of caution to the bride-to-be using this book as a guide: DO REMEMBER that simplicity is always in the best of taste, and DO consult with your own clergyman before making too many plans. Most clergy prefer to stress the sacrament and play down elaborate decorations.

G. P. W.

The Pineapple. Botany, Cultivation, and Utilization

J. L. Collins. Leonard Hill Books, Limited, Eden Street, London, N.W.1, England. Distributed by Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, New York. 1960. xviii+296 pages. Illustrated. \$9.75. (Library)

This title is another addition to the World Crops Series of handbooks published by Leonard Hill-Interscience under the general editorship of Professor Nicholas Polunin.

Most people consider the pineapple to be the most important contribution of the western hemisphere to the galaxy of world fruits. Unknown to Europeans before that November day in 1493 when Columbus on his second voyage first saw and tasted this delicacy on the West Indian island of Guadeloupe, it had already been in cultivation since prehistoric times by aboriginal peoples in the American tropics.

The discovery and history of the pineapple, though amply covered, constitute but a minor part of this well illustrated reference volume,

which certainly is the last word, reviewing all that should be known and said about the botany, cultivation and utilization of the pineapple throughout the world. The author, for a number of years, was geneticist and acting director of that center of pineapple lore and science, The Hawaiian Pineapple Research Institute at Honolulu.

W. H. H.

Driftwood in the Home

Florence M. Schaffer. Hearthsides Press, Inc., 118 East 28th Street, New York 16, New York. 1960. 128 pages. 111 illustrations. \$3.95. (Library)

The author explains that the name "driftwood" is actually a misnomer, since it has now become a general term to cover many types of weathered wood. The first chapter is a very thorough coverage of the various woods and different methods of finishing them.

There are chapters on many uses for the odd shaped pieces of weathered woods, such as "Driftwood for Accent and Line;" "Tables, Lamps, Fireplaces;" "Candles and Candelabra," and so on. These are presented in a very usable way—an illustration with the text alongside, describing the method used to prepare the wood, then the arrangement, placement and accessories.

Many readers will not care for all of the designs and uses of the wood, but there is enough variation to have some appeal for everyone.

G. P. W.

Cacti

E. Shurly. Abelard-Schumann, Publishers, 6 West 57th Street, New York 19, New York. 1959. 160 pages. Illustrated. \$4.50. (Library)

This book is mainly concerned with the culture of cacti. The introduction and first chapter deal with the history of the cactus family and its ecology. This enables the reader to better understand the chapters that follow, except that some of the facts concerning history are no longer generally accepted.

The second chapter pertains to general cactus cultivation while the remaining chapters cover specific cultural information: from soil preparations and propagation to diseases and environmental controls.

Although few in number, the diagrams and color plates are well done.

I feel that this book will be of help to growers in this country. The book was written, however, by a grower in the British Isles where the climate is quite different from that in most of this country.

PAUL W. SHAW

The Lily Yearbook of the North American Lily Society Number Thirteen, 1960

George L. Slate, Editor. North American Lily Society, 21 Oakland Street, Lexington 73, Massachusetts. 1960. 166 pages. Illustrated. \$4.00 (Membership). Library)

The yearbook of a predominantly amateur society should be a balanced blend of sound sci-

tific and horticultural information with what may be called "horticultural gossip." Too much of the former will drive away the newly initiated while a predominance of the latter will defeat one purpose of any horticultural group—that of instruction and improvement of its membership.

The thirteenth yearbook of the North American Lily Society meets these requirements well. The informative articles are, for the most part, easily read and cover a broad array of topics from new sales methods through recent developments in lily breeding to lily hunting in the Philippines, and nematode control. Of particular interest in its portent for the future is the address given by Jan de Graaff at Haarlem, Holland, on the present status of lilies in commerce. His outline of sound commercial procedure and its effect on the future of the hybrid lily trade should be read by all who buy lilies. In another article Mr. de Graaff describes the procedures and goals of his hybridization program with specific reference to hybrids of *Lilium auratum*. The production of hybrid lines in quantity and of quality is perhaps the most significant advance in the genus in recent years. The techniques used by Mr. de Graaff merit study by those working with any group of ornamental plants.

RICHARD W. LIGHTY

A Fresh Herb Platter

Dorothy Childs Hogner. Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1961. 240 pages. Illustrated. \$3.95. (Library)

Here is a delightfully written as well as a very useful book for anyone who has been affected by the current popularity of growing and using culinary herbs. About the only aspect of herbs that is not covered is their identification. The book opens with four chapters devoted to planning, preparing and planting herb and vegetable gardens. This includes a chapter on growing herbs in boxes and containers. The fifth chapter covers the use of herbs including harvesting, freezing and drying, and lists utensils, additional seasonings and wines that would be useful to have on hand.

About half of the book is essentially a cookbook containing many recipes for vegetable, meat and fish dishes, salads, and desserts, all of which call for herbs. I would like to be able to say that I have tried many of them as they do sound delicious.

The book closes with a chapter on preparing the garden, the herbs and the vegetables for winter. There is a very inclusive index. The occasional illustrations are very attractive drawings by Nils Hogner.

D. G. H.

Trees, Shrubs and Woody Vines of the Southwest

Robert A. Vines. University of Texas Press, Austin, Texas, 1960. 1104 pages, illustrated, specially by Sarah K. Arendale. \$25.00.

This large volume represents more than twenty-five years of work on Mr. Vines' part and

eighteen from Mrs. Arendale. It also represents the combined interests of a great number of individuals who believe in what it contains and the merits of the two persons represented by the book itself.

Mr. Vines' approach is rather that of the naturalist than the taxonomic botanist, though he has made use of every finding that they have recorded and of their personal assistance as well. His plan of presentation is in accord with the basic structure of botany, but there are no major "keys" and few shorter ones, only rather full texts with the ever useful, but not always present paragraph under the heading of Remarks, and Mrs. Arendale's fine drawings. It is all supported by an extensive list of acknowledgments, bibliography, two indices and a long list of patrons.

While the strict taxonomic botanist may regret there are no keys, they cannot fail to admire his full descriptions, and the additional data, ecological, horticultural, and such references to wild life as related to the plant under discussion. The amateur, on the other hand, should be as much pleased as if he had just received a spectacular new plant catalogue. His only disappointment may come when he realizes that if he wishes the plant, he may have to retrace the thousands of miles Mr. Vines has travelled to find it.

For the person who is merely interested in plants, it is a thriller, a word not often used in connection with such works, and used here as an accolade.

The reviewer, who is a gardener, knows that his chances of making the species that intrigue him most, happy in the moist climate of the Mississippi Gulf Coast are practically nil, but that does not lessen his interest in what he sees here. And when he comes to the description of *Esenbeckia Runyoni*, "known only from 4 specimens in the lower Rio Grande Valley" he knows his one small plant is a particular treasure, and hopes for the best. Having just acquired the not included *Choisya ternata* known from California days, he hankers for *C. dumosa* illustrated here, even if the chances for success are limited, were it available. One might continue almost indefinitely.

Since the area treated includes the States of Arkansas, Louisiana, New Mexico, Oklahoma and Texas, there is a wide range of plant types, from those that are related to the plants of the southeast on one hand, and those to Mexico and our southwest on the other; some from low elevations, some from high; some from cold-winter areas, some from near tropics. The illustrations give good details, sometimes as if from fresh material, sometimes as if from herbarium sheets. The impressions are unusual in some cases, as for example, *Acacia farnesiana* is shown flowering without leaves; here it is evergreen or nearly so and blooms with the leaves, a climatic result.

Since the author states clearly and sharply, precisely what he intended doing, with definite limits of the plants to be treated, and definitions of all dubious words, the result is excellent; and if one has any regrets, they are on the limits self-imposed. A book for browsing indefinitely, then for starting into action, to find what one must have!

B. Y. M.

The Gardeners' Pocketbook

Dragon Tongue

There is a plant that has been in my family for about a hundred years, and I have never heard of anyone else in the world ever having had one, though there must be others. Someone sent it to my great grandmother back in the middle of the last century. I say a plant, but it is really a corm, and, of course, the original corm has long since died, and many of its descendants have died, for as each one grows to maturity and blooms for a number of years, it puts out offshoots of small cormlets. These reach maturity and begin to bloom by the time the old one dies. So, in all these years, as well as anyone in the family can remember, there has never been a spring in which there was not at least one bloom.

This flower was known in the family as the Dragon Tongue. No one ever knew its botanical name until last year when B. Y. Morrison identified it for me, with the help of a Kodak picture and a description. He said he was sure it was "*Dracunculus vulgaris*," a member of the Arum Family. So then I looked it up in Bailey and there it was, with not only a perfect description, but a picture. It is a handsome plant, just one straight shoot out of the ground, about two feet tall, with a mottled surface like a snake skin. It has large deeply cut leaves, the lobes of which come off a curved base and the whole leaf extends on a small stalk from the main stalk made up of enfolded leaf bases, from the center of which comes the flower. On a well developed corm the flower is from twelve to fifteen inches long, perhaps as much as eighteen inches. It has the shape of a calla lily, a deep purplish maroon, with a large black tongue in the middle.

The chief thing about the Dragon Tongue is its odor. For the first 24 hours after it opens, you would swear there is a dead rat close by. I have seen buzzards alight on the fence above where it was growing, but they could never find what they thought they were looking for. During the first day the inside of the flower is covered with green flies. After the odor dissipates, the flower stays in bloom several days. Then it slowly withers and the whole plant withers and disappears.

When my sisters and I were children and it was growing in my grandmother's garden, we loved to sit on the front

porch, the side of which faced the street, along which was a fence with a flower border just inside. It was here that the Dragon Tongue was planted. On the first day of bloom we would see the people walking by the fence out on the street sidewalk, and as they came near the flower they would suddenly grab their noses and peer over the fence, looking very much puzzled, but I doubt if they ever suspected that handsome flower as being the offender. The corms in my garden have been moved from their original spot four times, but they continue to bloom. Last year the flowers (there were two of them) were very small, not more than eight or ten inches long. I think it was because it was a very dry spring. This year (March 1961) there are two plants coming up, and I hope they will do better, though they are both rather small.

I wonder if any one has ever seen this plant. I would be glad to hear from anybody who is familiar with it. My friends ask me, "What do you want with such a plant?" Why, I wouldn't be without it for anything. I consider it an heirloom, and I am very fond of it. It certainly is a curiosity, if nothing else, and it is a handsome plant and flower.—ISABEL B. BUSBEE, *Raleigh, North Carolina.*

Pittosporum glabratum

Among the many gibes at landscape plantings in the South, are those that have to do with the ubiquitous *Pittosporum tobira* which is used with a monotony that is not unlike that of the Japanese barberry or Van Houtte's spirea in other parts of the world. Since the genus is fairly large and more species are used in California, it has been a puzzle to know why other species have not been tried in the South, or of their failure if they have been studied. Just as many viburnums have only minor beauty, many pittosporums are easily damned with faint praise, but memories of tall hedges of *P. undulatum* and specimens of *P. eugenioides* continue in the editor's memory.

As yet, no report can be given on *P. undulatum* as the two plants on hand are still in pots in the cool greenhouse, but while standing outside this summer



G. HAMPEL

Dracunculus vulgaris

they made excellent growth, one flowered and set seed. Some visitors from Florida looked and shook their heads, but offered no comments.

The same visitors and others, however, were interested in the old plant of the species named here which has been growing more than ten years without accident, while *P. daphniphylla* in a slightly less favorable place died after some years of indecision.

The original description of *P. glabratum*, which Mr. Paul Russell copied for me, reads:

Bushy shrub, 4 to 8 feet; leaves somewhat whorled, 2 to 5 inches long, narrowly obovate slender-pointed cuneate, margins uneven, shining green. Flowers dullish yellow, fragrant, $\frac{1}{2}$ inch long, in terminal clusters of 6 to 10; flower stalk $\frac{1}{2}$ to 1 inch long, May, China, 1845.

Our plant, introduced under P. I. No. 105620, is grown from seed sent over from China, collected by Albert N. Steward and H. C. Cheo, "in a valley at 1,100 ft. altitude, near Tatchetsuen, Yung Hsien, Kwangsi Province, in October 1933." The collector's note reads: "A small evergreen tree about 10 feet high with globose capsules."

The species is not mentioned either in Bailey's *Cyclopedia* nor *Hortus II*, and as it is only now apparently coming into propagation, that is understandable. Nothing has been done to propagate from our plant, which has not flowered or fruited as yet, but Clarke B. Wilson tells me that he had no difficulty in rooting cuttings at his nursery near Gulfport.

All broad-leaved evergreen shrubs and trees are welcome additions and this plant with its thick bushy habit, and glossy green leaves that hang with something of the same grace that one sees in the camphor tree, is apparently going to be a staple item once it is spread about. It will tolerate pruning and grows in a mixed shrub border close to the house so that rain from the roof falls in showers at times, although there is no drainage or runoff problem. If it can now be persuaded to flower and fruit, it will be a complete success. Certainly its habit will make a stunning contrast to that of commonly grown evergreen viburnums, euryas, cleyeras, and ligustrums!—B. Y. MORRISON, *Pass Christian, Mississippi*.

Jojoba—An Overlooked Ornamental Shrub of the Arid Southwest

During the past quarter-century there has been recurring interest by chemurgists in the jojoba (*Simmondsia chinensis*), a native shrub of the arid southwest whose acorn-sized fruits—variously called bushnut, coffee-berry, goat-berry, goat-nut, pig-nut, etc.—have been shown to contain an unusual liquid wax having many potential industrial applications. Apparently overlooked—as is so often the case with native species—is the ornamental character of this plant, which should make it a useful shrub in horticulture for southern Arizona and adjacent parts of California, or anywhere for that matter where a mild Mediterranean-type climate with wet winters and dry summers prevails.

Simmondsia chinensis is an evergreen xerophyte with leathery, perennial leaves. Because of its evergreen habit and the relatively large size of its persistent drought-resistant leaves, it is exceptional among the desert plants of North America where the great majority of woody perennials have small and ephemeral leaves. Its root crown is large and woody, bearing a number of tough stems producing very attractive mounds of foliage. Like the hollies (*Ilex*) the jojoba is dioecious with plants being either male or female. The flowers are inconspicuous. Female flowers lack petals and appear in solitary fashion usually at alternate leaf axils. Male flowers, on the other hand, are more showy, being clustered in pale greenish-yellow axillary heads.

In nature the jojoba occurs widely in the Sonoran Desert (principally around the upper two-thirds of the Gulf of California) and at its northern range extends to central Arizona and southern California, where it is seen to best advantage in the transition zone between the so-called Sonoran Desert Scrub and California Chaparral. It apparently finds its best development in relatively frost-free areas having ten inches or more of annual average precipitation and seems to favor coarse, well-drained alluvial soils on slopes in valleys throughout its range.

In general habit of growth jojoba reminds one of the common box (*Buxus sempervirens*), which is a close relative in the same family (BUXACEAE). Like box, jojoba is evergreen and its numerous branching stems produce attractive hemispherical mounds of gray-green foliage. Because of the similarity of its growth form *Simmondsia* might well be used horticulturally as a southwestern substitute for box. Under normal conditions of growth it should require little or no training, though the compact habit would also lend itself to judicious clipping or shearing as required to keep the plant within bounds. The low growth habit should fit in well with ranch-type homes which are so widespread in the southwest, while the drought-resistant nature of the plant indicates that it should thrive with a minimum of watering.

Although the jojoba is not yet recognized as a potential subject for ornamental horticulture, specimens may be seen in a few southwest gardens. Several



W. H. HODGE

Male flower clusters and leaves of Simmondsia chinensis

fine plants are cultivated in the succulent collection at the Huntington Garden, San Marino, California. Plants growing under natural conditions occur at the Boyce Thompson Southwestern Arboretum, Superior, Arizona. Jojoba plants apparently must be grown from seed. Since a strong taproot is soon produced, older plants are said to be difficult if not impossible to transplant. Young plants may also require some protection from frost though it appears that, once established, they are more tolerant of temporary sub-freezing temperatures. —W. H. HODGE, *Longwood Gardens, Kennett Square, Pennsylvania.*

Franklinia alatamaha

I believe flowering trees are the *summa bonum* of gardening endeavor.

To plant a small switch, bare of leaves, and over the years endow it with the constant care necessary to realize its fullest flowering development, requires a deep devotion to the principles of gardening, and in turn provides a stabilizing influence, so necessary to meet the trials of modern life.

In my life span I have marveled at the abandon of *Malus floribunda*, so completely covered with spring finery its branches were obscured; stood in awe of

Magnolia campbelli's pure rose chalice standing stark against naked limbs; beat rhythm with the fluttering white doves of *Davidia*; warmed to the glowing crimson lanterns of *Tricuspidaria lanceolata*. Each one, and many more, have pleased and repaid me for their being.

And yet, if I must choose to live with one, I would unhesitatingly ask to be allowed the seasonal pleasure of my Franklinia grove. To this planting of twenty trees, I am attracted every day of the year.

In early spring, after a warm rain has encouraged the glistening striated grey branches to erupt in crimson pin point growth buds, these followed by tender, bronzy green terminal leaf tufts.

Summer foliage is deep glossy green with red midrib, providing ample cover for sassy bluejay and sweet songed mocking bird.

Formation of the cool green marble-like buds begins in July. There is a fascination in the slow development of the buds, one nestled in the axil of each uppermost leaf. In August the embracing guard petal relaxes its protection, and the pearly ball opens into a chastely beautiful five petaled white cup, with sumptuous boss of orange stamens, and delicate perfume.

There is a constant progression of these appealing three-inch blossoms starring the trees for many weeks, climaxed in November. Then, with chill nights, the lustrous green foliage of each tree becomes a conflagration of autumn color. Gold, bronze, orange, scarlet, burgundy, throwing into bold relief the snowy white flowers.

It is a friendly tree, named by a Philadelphia Friend, John Bartram, for his good friend, Benjamin Franklin. Easily our rarest and most distinguished native flowering tree, its history is unique.

Discovered growing on the banks of the Altamaha River in 1765 by Bartram, the site was last visited in 1790. Since that time Franklinia vanished, and has never been found growing in the wild. Legend has it that all existing trees are a part of the seedling transported by Bartram in his saddlebags from the original grove to his botanical garden in Philadelphia.

That John Bartram was chosen by fate to preserve this thing of beauty for gardeners, I am thankful.—D. TODD GRESHAM, Santa Cruz, California.

Chilean guava

This evergreen shrub was one of my favorites when I first saw it and smelled the strawberry-like odor of its fruit. I decided that when and if I ever lived in a climate where it would grow I would have a hedge of it. Now that I do live in California I have a low hedge started of this ornamental and useful plant.

Myrtus ugni or *Ugni molinae* is a native of Chile and has been known since 1844, before the middle of the last century. Queen Victoria had a great fondness for jam made from the berries and saw to it that she had a supply on hand when it was available.

In appearance it is a fairly compact growing evergreen with ovate dark green leathery leaves about $\frac{3}{4}$ inches long, whose upper surface is convex and attached by a short pedicel to the branch. The new growth is reddish in appearance, while the flowers have waxy pinkish white petals shaped to form a globose corolla. These flowers are fragrant and are replaced in a few weeks by the equally fragrant fruit which are dull reddish brown berries about $\frac{1}{2}$ inch in diameter.

As a hedge it can be clipped very successfully and kept to a moderate height, probably 5 feet or more. It will grow up to 8 feet but does need shaping to stay compact.

It will stand temperatures down to 18° or 20° but probably would not stand this over a prolonged period. Last winter and this winter a night temperature to 23° caused no damage at all.—FREDERICK W. COE, Ross, California.

Chinese Quince

Chaenomeles sinensis is a small fruit tree well adapted to the deep south. The dark green, finely serrate, oval leaves turn bright red in fall. The very large (6" long) oblong fruit is high in pectin and acids, making it useful to blend with apples and milder fruits for jelly. It is too hard and strong tasting for most people to eat out of hand. The fruit is so aromatic it is sometimes placed in rooms for the odor.

The tree has a picturesque crooked growth habit and smooth bark. The pink flowers while not as large as those of flowering quince (*C. lagenaria*) are attractive.

According to the 1937 *Yearbook of Agriculture* the tree is hardy as far north as Philadelphia. In the lower south where many of the pome fruit varieties are not adapted, the Chinese quince grows well. It seems little troubled by fire blight in Houston.

In late summer when flowering quinces are raggedly foliaged, the leaves on Chinese quince are still neat appearing and dark green.

It is hard to understand why such a useful small tree is so little known. It should not be considered for the same uses as flowering quince because it is an entirely different type of plant. It is typically a sturdy, single, trunked small tree instead of a low branched shrub. It is sometimes used as an understock for Photinia serrulata which seems to be an undeserved fate.

The tree has been used so little that much could probably be done with it. Will it hybridize with common quince (*Cydonia oblonga*) or the other Chaenomeles species? I don't know if that has been done but even in its present form it is a versatile small tree.

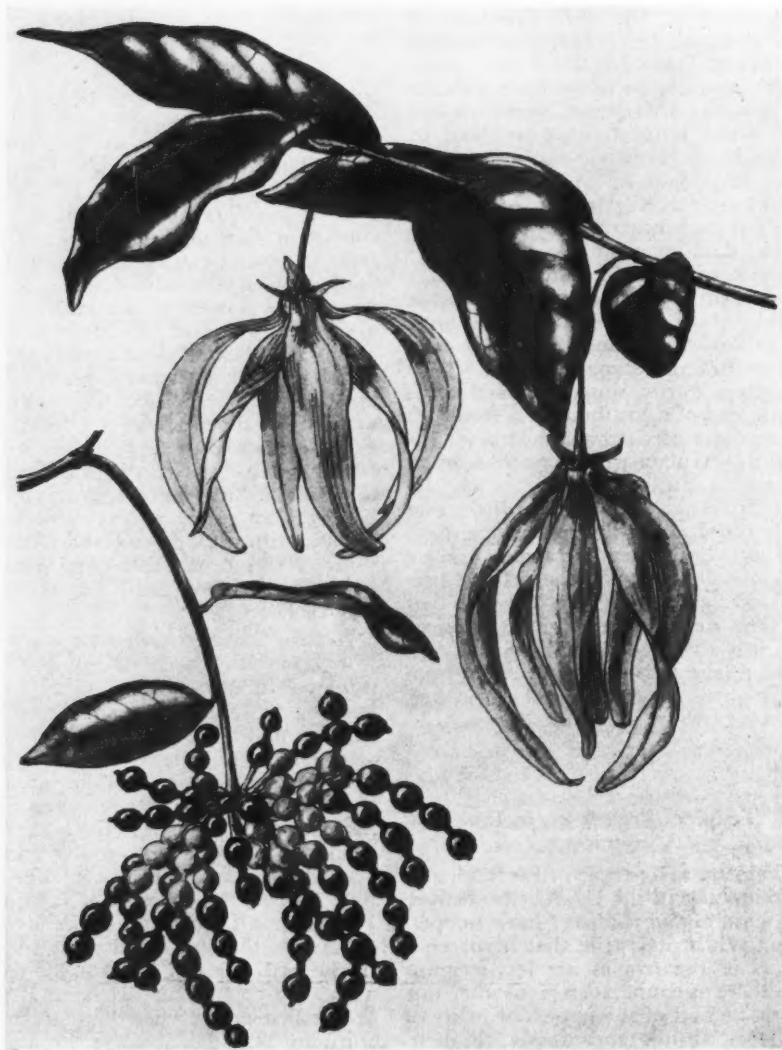
Down here they grow very easily from seed planted in the ground in winter. —LYNN LOWREY, Houston, Texas.

Tropical Fragrance in the Annonaceae

There are still people in England, and doubtless also in the U.S.A., who believe that East of Suez flowers have no perfume. Whilst it is true that herbaceous flowers of the tropics are less fragrant than those of temperate regions, the same cannot be said of the flowers of many of the trees, shrubs and woody climbers. Those who think on this will recall the genera known to them, possibly seen only on visits to heated greenhouses, with flowers renowned for their fragrance —*Gardenia* from S. China, *Michelia* from India, *Jasminum* from tropical Asia and Africa and *Plumeria* from Central America and the West Indies now so widely cultivated in the tropics. I wonder how many will think of the ANNONACEAE in this connection. This family is best known for its edible fruits and species of *Annona* and *Rollinia* are cultivated through the tropics and subtropics yielding the cherimya, soursop, bullock's heart, custard apple and other less

well known fruit. To a botanist the family is of especial interest in that the sepals and petals of the flowers are in threes, a feature which is associated with the monocotyledons, whereas fours and fives are commonplace in the dicotyledons. The fruits are unusual. They may consist of numerous berries in rows appearing like threaded beads of different colours or they may be aggregated to a lesser or greater extent, this achieving its maximum in the edible fruits of *Annona*. The flowers of one genus *Monodora*, from Tropical Africa, are both unusual and beautiful and appear like hanging Japanese lanterns made of yellow, red and purple lace. The flowers of most of the other genera are less showy, many in fact dull and inconspicuous, pendant strips of twisted green and yellow ribbon. But what the flowers lack in beauty they amply repay by their fragrance. Illustrations and short descriptions of three examples are included here to whet the appetite for the bizarre and exotic!

Desmos cochinchinensis Loureiro is a woody climber native of South China, common in Hong Kong, with flowers opening in June. They are exceedingly fragrant and may be recognized by smell at a distance of several yards. The scent is like that of orange blossom but more aromatic. A single flower when at its most fragrant stage will fill a car with perfume; both the very young and the very old flowers are scentless. The pendant flower, 3 inches long, consists of 3 small sepals and 3 plus 3 petals; it is solitary at the end of a long, thin stalk in the axil of a leaf towards the end of a short lateral shoot. Sepals and petals are at first green when they are inconspicuous but they change to a clear, light, golden yellow—often with bright red marks at the base of the petals. As the flower fades the segments change to a uniform rust-red colour. The fruits are unusual and conspicuous. From the end of the flower-stalk are produced a series of carpels which radiate outwards. Each contains from one to seven seeds about the size of a pea and in between each seed there is a constriction. At first these fruits are green but in the autumn months they change from green to yellow, from yellow to orange and red and finally from red to deep purple or almost black. These yellow and red and red and purple clusters of fruits are very



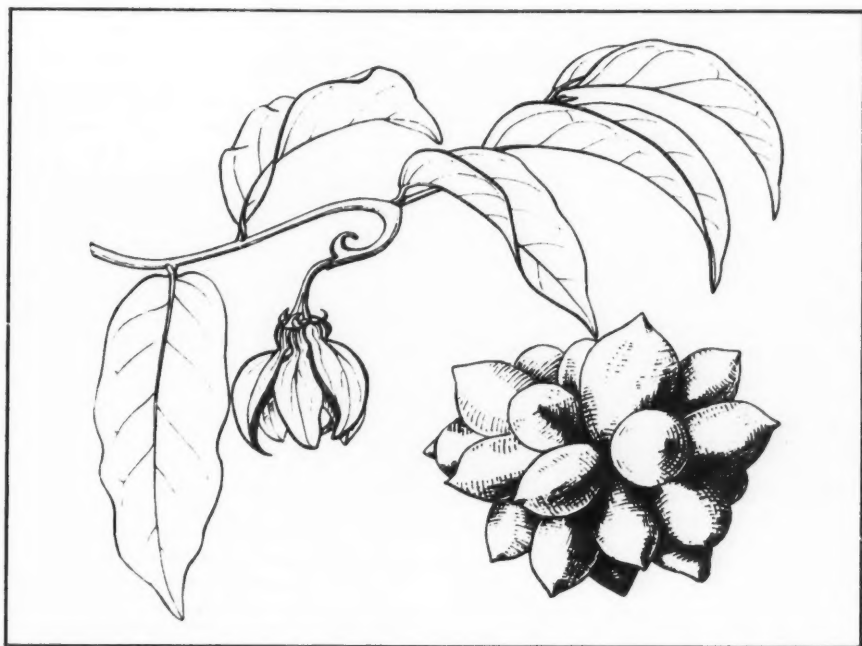
WATER COLOR DRAWING—G. A. C. HERKLOTS

Desmos cochinchinensis

noticeable during the early winter months. The fruits are ripe in December.

Artabotrys odoratissimus R. Brown is a large woody climber native of S. E. Asia and frequently cultivated by the Chinese in their gardens and near their temples in S. China. It is also cultivated in other parts of the tropics as for example in Jamaica. The flower, $1\frac{1}{2}$ inches long, is similar in form to that of *Desmos* but the six petals are shorter

and thicker, waxy in appearance, at first green becoming pale yellow. As the specific name implies the flowers are exceedingly fragrant. In the northern tropics it flowers from May to July. *Artabotrys* is from the Greek and means "suspended grapes" in reference to the fruits. They differ from those of *Desmos* in the carpels being shorter, thicker and fewer seeded but they are still free from one another, not fused as in *Annona*.



DRAWING BY G. A. C. HERKLOTS

Artabotrys odoratissimus

The bright yellow pulp around the large seeds is just edible. A peculiar and interesting feature of this climbing plant is the way it holds on to its supports. The flowers are borne one, two, three, or even four on short curved, hook-like inflorescences which appear to terminate the short, lateral branches. These hooks swell and become woody after each has encircled a stem of the same plant or a twig of the tree up which the climber is growing.

Canangium odoratum Baill. is a large tree, often attaining 100 feet, but more frequently half this height, and is a native of S. E. Asia from Burma through the Malay Archipelago to New Guinea and N. Queensland in Australia. It is perhaps most commonly associated with the Philippine Islands where it is cultivated expressly for its flowers from which an oil is distilled and made into scent. The oil is called ylang-ylang oil and is one of the ingredients of Macassar-oil. The flowers are produced in great abundance in clusters in the axils of the leaves on the older part of the twigs. The

tree, with its drooping branches ending in dangling tips weighted down with the pendant flowers and dark green changing to black fruits, is very easily recognized. Each flower is from 3 to 4 inches long with six twisted, ribbon-like petals, as in *Desmos*, at first green turning light yellow and, when mature, is exceedingly fragrant. If one is carried loosely in the hand for a few minutes the fragrant oil, emanating from the flower as a result of the warmth, penetrates the skin and causes the hand to become and remain fragrant for hours. There are two prolonged flowering seasons each year so the tree is more often in flower than not. There is a dwarf variety from Thailand which remains a bush flowering freely at 3 feet; the flowers have very curly petals. This shrub is quite suitable for cultivation in hot houses in temperate countries. *Canangium* is from the Malay Kenanga. Ylang-ylang is a Philippine word meaning fluttering, with reference to the flowers.—G. A. C. HERKLOTS, Kathmandu, Nepal.

Zephyranthes smalli in North Carolina

Mr. Morrison wants to know how many flushes of bloom there are on *Zephyranthes* (or *Cooperia*) *smalli* in one season. I am sorry to say that I have not made a note of them, in spite of the fact that my two little bulbs are planted right outside my studio window. Whenever I look up from my work and see that scrap of yellow, all I would have to do would be to draw their card from my file, and make a note. I know there are three flushes, and I rather think there are four or maybe five. The first two flowers, they are usually in pairs, generally appear about the middle of August, but once they came in mid-July. There is one in bloom today, the fifth of October.

I read about this amaryllid in *Herbertia* 1953. Fred Jones wrote that he was driving along in southern Texas one afternoon in July about two-thirty, and saw some rain lilies just opening, and one of them proved to be *Z. smalli*. The next spring I found it on Wyndham Hayward's list and it has bloomed in my garden ever since, delighting me by its habit of beginning to open punctually at two-thirty. You can almost tell time by it. The color of the flowers is near Ridgway's Amber Yellow, with a reddish flush on the back of the petals. They are practically scentless, and their stems are tall, eight to twelve inches, for their diameter, about an inch and one-half. The lax, rat-tail leaves are a little longer than the stems. Though there are lots of seed, I have never had any seedlings; the original bulbs do not seem to have multiplied much.—ELIZABETH LAWRENCE, Charlotte, N. C.

A Fabulous Bromeliad

During my most recent botanizing trip to Nicaragua—at the end of 1959, and the beginning of 1960—I was privileged, through the courtesy of my good and learned friend, Don Leo F. Salazar, of Santa Maria de Ostuma, near Matagalpa, to make an ascent of one of the Republic's highest mountains, El Picacho.

This peak overlooks the city of Matagalpa, and is reputed to attain a height

of approximately 8,300 feet above the sea. Because of this exceptional—for Nicaragua—elevation, one encounters on the upper slopes of El Picacho a most exuberantly varied and interesting forest flora, one of the most unique in this part of Central America.

Our ascent of this fascinating mountain was greatly facilitated by the fact that not too long before, a group of engineers from the United States had done some surveying work from the summit, and had, during their operations, broadened and cleared the principal trail leading up from the base. Despite this, however, upon entering the weird "moss forest" which covers the uppermost parts of the peak, it seemed that for every step forward we made on the saturated, moss-covered path, we took two lurching steps backward.

I shall not at this time burden my readers with explicit details of all the marvelous wealth of bromeliads, orchids, and other epiphytic growths we encountered as we worked our way up this mountain; my purpose just now is to introduce to you one of the bromels which we discovered on El Picacho, a species which ranks, in my opinion, with the very finest in the entire family! This is *Vriesea montana*, illustrated in the accompanying figure; this is apparently the first photographic record of the species ever to be published. The discovery of this bromel represents yet another new record of a plant of the BROMELIACEAE for the Republic of Nicaragua, this species previously being known only from Honduras and Guatemala.

Vriesea montana is not a particularly old species, having first been described in 1938 by our contemporary authority on this family, Dr. Lyman B. Smith, under the name of *Thecophyllum montanum*. The type specimen was found in Honduras' Department of Comayagua. It was transferred to *Vriesea* in 1953, by Smith and Pittendrigh.

The first specimen of this extraordinarily attractive *Vriesea* which I encountered on El Picacho grew on a mossy liana by the trailside, almost hidden by the graceful yet eerie dripping festoons of the mosses and beard-like lichens which hung on every available inch of space. I had stepped off the path to inspect more closely a splendid specimen of the odd epiphytic viney shrub, *Thibaudia*, of the Heather Family [ERICA-

Vriesea montana

(shown in the lower right, with two large plants of an unidentified bromeliad, on summit of El Picacho, Nicaragua)



ALEX. D. HAWKES

CEAE], with masses of intricate waxen, bluish-pink and scarlet flowers.

A flash of lacquered blood-red so vivid it made me think of a parrot drew my attention to the bromeliad's rosette. Carefully I stripped away some of the chilly, sponge-like mosses which enveloped the plant, and felt a thrill run through me that had nothing to do with the cool temperature of this highland forest!

This bromeliad measured upwards of eight inches in diameter, with a considerable number of broad, very glossy leaves placed close together in a very graceful, somewhat ascending rosette. In color they were basically a lustrous green—almost a lime-green hue—with a fantastically complex system of transverse, irregular lines and hieroglyphs (shaped much like those found on the popular Brazilian *Vriesea hieroglyphica*, in fact) of this marvelous rich blood-red which had first caused me to take notice of the plant. The leaf-sheaths (or leaf-bases) were found to be solidly of this red shade, heavily lacquered, when I pulled down a couple of the older leaves. (Smith, in his description of this species, states that the leaves are "transversely marked with broad purple wavy bands," but the Nicaraguan specimens all boast this glorious blood-red color instead.)

This was evidently a mature specimen of *Vriesea montana*, since the stubby remnants of a flower-spike protruded from one side of the rosette—not from its cen-

ter, please note, as is generally characteristic of bromeliads. This lateral flowering-habit is typical of the species, insofar as I have noted it, and does not seem to have been previously mentioned in the literature.

The extreme summit of El Picacho, as I have mentioned, is relatively flat. Considerable clearing had taken place here, though a few gigantic trees still remained where they had been felled, though they were largely stripped of their branches. On every one of these limbs, on the trunks themselves, and on the rock outcroppings of the peak sat literally thousands of bromeliads! The principal species was a large and very attractive plant as yet unidentified (see illustration) a massive, dense, crateriform rosette often three feet across, yet only a foot or so high, made up of numerous broad, solidly pale-green leaves. And scattered among these "unknowns" were dozens and dozens of my lovely *Vriesea montana*, often growing so closely packed against one another on a single branch that I could scarcely distinguish the host's bark.

Because of their sudden and total exposure to the tropical sun—due to the cutting down of the trees and removal of all normal shade—in many instances almost all of the ordinary green coloration of the foliage had changed to a dull red hue, against which the cross-markings stood out with startling and spectacular clarity. A few of these bromeliads still

bore the remains of old inflorescences, with their stout, mahogany-red scapes and small but dense, rather nondescript flower-clusters, surrounded by sizeable roundish bracts.

Since many of these *Vrieseas* already showed signs of dying through over-exposure, I gathered quite a few of them—though our collecting-bags were already packed to the brim with botanical "goodies" found during the ascent of the mountain—and took them back with me. I brought in five of these specimens when I returned to Florida, but because of the severe fumigation they received upon their arrival here, not one of them survived.

Vriesea montana is, unfortunately, one of the very numerous kinds of bromeliaceous plants which will never, I fear, become a frequent inhabitant of our collections. It inhabits, insofar as I know, only very restricted areas at high elevations (usually on the extreme summits of mountains), and grows under highly specialized conditions which are almost impossible to emulate in cultivation. The combination of such integral factors as consistently chilly temperatures (even though the sun is fiercely hot), excessively high humidity, copious rain and nocturnal dews during the dry season, and quantities of fresh, free-moving air, can never be accurately reproduced artificially.

It seems possible, though, that for those plantmen fortunate enough to own an air-conditioned greenhouse such as that specially designed for housing "alpine" epiphytic orchids, such as odontoglossums, cochliodas, and miltonias, might conceivably enjoy some success with this glorious Central American *Vriesea montana*, and the others of its alliance which occur in this fabulous part of the world. Perhaps at some future date, we can again attempt the introduction of our "parrot-colored" beauty from the high mossy mountain-tops of Nicaragua, and hope for better luck next time.—ALEX D. HAWKES, *Coconut Grove, Florida*.

Osmanthus "San Jose"

This hybrid *O. ilicifolius* × *O. fragrans*, apparently the reverse cross from that of *O. fortunei*, makes an excellent tall evergreen shrub, that carries the

slender erect habit of *fragrans* with much better branching. It responds well to pruning, and some pruning is advisable to induce even more branching. The serrations on the leaf margins are more like those of *fortunei* than those of *ilicifolius*, and the flowering, while like that of *fragrans*, is much more abundant, and comes in one splendid mass in late October, lasting into November, rather than in the intermittent burgeoning of *fragrans*. The scent is delightful, and pervasive, like that of *fragrans*, and yet unlike it. The writer has not flowered *ilicifolius* here and so can make no comparison and memory provides nothing, as *ilicifolius* blooms so late in the year in Washington, D. C., that no fragrance was noted, and it cannot be compared to that of the native *O. americanus* which flowers once a year, late winter, en masse, but only in such years as it may please. It too has a delightful scent, suggesting the fruit of lemons, not their blooms.

Whether or not its behavior here is typical cannot be stated, but all of the plants grown here have not flowered until they had made a considerable growth, up to eight or ten feet in height. Since then blooming has been annual: no fruit has set.

As yet there are no plants here of: *armatus*, *aurantiacus*, *fortunei* or *serrulatus*, but a new plant of what used to be *O. delavayi*, now removed to its own genus, *Siphonosmanthus delavayi* appears to thrive, has flowered sparingly after its move, and will make an excellent addition, as its habit is more spreading and the leaf characters as distinct from its one time fellows as are the blooms.—B. Y. MORRISON, *Pass Christian, Mississippi*.

Habranthus

I was interested in what Mr. Morrison wrote about *Habranthus*. He said that *Habranthus brachyandrus* does not like his soil or climate; yet it comes from southern Brazil, and you might think it would prefer the Gulf Coast to my garden and Canon Ellacombe's. "I have rather a nice thing in flower now—*Hippeastrum brachyandrum*. Do you know it?" the Canon asked Mr. Bartholomew, in a letter dated November 14th. "I advise you to get it. Mine came from some out-of-the-way garden in Berkshire, so you will have no difficulty."

I have no clue as to the year this letter was written, but it must have been about the turn of the century, as *Habranthus brachyandrus* was not in culture in England before 1890, and the Canon died in 1916. I would dearly love to know more about the performance of this still rather uncommon amaryllid in the garden at Bitton Vicarage, but there is no comment on it in either of the Canon's books.

In North Carolina *H. brachyandrus* has never bloomed in November, but recently it has taken up flowering in October. These late blooms are much the loveliest, as they open wider and last longer than those that bloom in the hot weather. I have grown it, in Raleigh and in Charlotte, for twenty years or more, and have found it the most steadfast of its family, though it is slow of increase. Occasionally it blooms in June, and usually there are flushes in July, August and September. Yet it is recommended only for the Far South.

Habranthus robustus, which is considered much hardier, bloomed faithfully in Raleigh, but suddenly disappeared from my Charlotte garden after it had become well established. Once it bloomed in May, and at times there were no flowers before July, but more in September. Usually there were flushes in June, July, and August.

Plants from Chile are not apt to take to North Carolina, but the Ox-blood Lily, which came to me as *Habranthus miniatus*, and is now (by some) called *Rhodophiala bifida*, blooms profusely and multiplies almost alarmingly. Dr. Traub suggested that I try *Habranthus bagnoldiana* (*R. chilensis*), which I did without success. Another bulb was planted a year ago last March, and now there are some slender leaves, twelve inches long and an eighth of an inch wide, lying flat on the ground beside the label. But they look suspiciously like those of a nearby *Nothoscordum* that Miss Willie May Kell sent me from Texas.

I have a theory that amaryllids in general don't care much whether they are wet or dry (within reason) or in sun or shadow, but that they have some private reason for blooming or not blooming. This fall Mrs. Sheets wrote that she had in bloom in her garden in Reidsville, North Carolina, a bulb with a flower like those of *Lycoris radiata*, but smaller,

daintier and pinkish lavender. It came into bloom on the nineteenth of November, and on the twenty-eighth she wrote that it was still fresh though there had been temperatures down to 25 degrees F. for four nights, and the Sasanquas had been nipped. She said I had sent the bulb to her, but without a label. *Nerine undulata* is the only bulb of that description that I know of that blooms in November, but I have no recollection of having sent it, and certainly wouldn't have expected it to survive, much less to bloom, in Mrs. Sheets' garden, which is much colder than mine, for it is uncertain and short-lived here. But it is just like a member of the Amaryllis family to hop up and bloom when you least expect it.—ELIZABETH LAWRENCE, Charlotte, North Carolina.

***Xanthoceras sorbifolium*, a rare shrub of merit**

I have been praising *Xanthoceras sorbifolium* as a shrub of merit since my first acquaintance with it in the Missouri Botanical Garden where I first saw it in flower nearly twenty years ago. But outside of a few gardens such as this, most people have never seen the plant or even know of its existence. Nurserymen continue to neglect it, possibly because the plant is not easy to strike from stem cuttings, and it is not a heavy seed producer, although two young plants in my own garden were grown from seed. The quickest method of propagation known to me is by layering or root cuttings.

Xanthoceras comes from northern China and is described as a small deciduous tree. In gardens it seldom attains more than eight to ten feet in height. It develops into a neatly tailored shrub ideally suited for the small garden. It is long-lived. The plant belongs to the large Soapberry Family which includes the well-known and much-appreciated Golden-rain-tree, *Koelreuteria paniculata*. In April, the pure white flowers with a golden-yellow eye are produced in panicles six to ten inches long as the new leaves are unfurling. The flower panicles are remindful of horsechestnut, to which it is not too distantly related. The large, smooth capsules borne in clusters resemble those of the same plant. Only the flowers of the terminal racemes are fertile and seed bearing. The smooth black

seeds are the size of small marbles. The pinnately divided leaves, five to eight inches long, retain their lustrous sheen throughout the summer, a feature which further recommends this shrub.

The cultural requirements of *Xanthoceras* are of the simplest. It should be grown in full sun for best flowering and preferably in well-drained soil. It will withstand zero temperatures, extreme heat, and drought. As suggested above, the plant may be propagated by seeds or by layering, from root-cuttings taken in February and brought into a warm room or greenhouse to force into growth the adventitious buds. The young plants are ready to set out after ninety days into the garden or nursery. In my own experience, young plants grown from root cuttings were no more difficult than other material propagated in this manner, such as *Aesculus parviflora*, a plant often propagated from root cuttings. By the layering method, young plants should start to flower in about five years. Only two or three nurseries are listed in the Plant Buyers Guide as sources of *Xanthoceras* in this country.—FREDERICK G. MEYER, *New Crops Research Branch, Plant Industry Station, Beltsville, Maryland*.

Indoor Culture of Bougainvilleas

Bougainvilleas may be grown in pots or be planted out in the corner of a greenhouse or conservatory. In a greenhouse, the best plan is to allow the plants to scramble freely along the roof or along the upper part of a back wall, where they will flower from April to November, producing flowers on new growth. Plants should never be shaded by other tall shrubs growing in the greenhouse. Bougainvilleas when grown in pots are started into growth in brisk heat after being kept dormant in a cool place of about 50°F. from about December until March. *Bougainvillea glabra* 'Sanderiana' will flower successfully with a night temperature of 60°F., but *B. spectabilis* 'Crimson Lake' and other cultivars of this species require relatively high night temperatures of the upper 60's and 70's to

flower well. Full sunlight is an important cultural requirement for best flowering of bougainvilleas indoors.

All long shoots of the previous year should be pruned off as in other vines and all weak shoots removed, leaving only strong wood.

A satisfactory planting medium consists of 3 parts turf loam, 1 part leaf-soil, with a copious amount of sharp sand. The heavier the loam the greater the amount of sand needed. Fertilizers should be added only in liquid form after the plants are in growth. To promote flowering, the nitrogen content should be minimized in favor of a relatively higher percentage of phosphorus. Bougainvilleas are easily propagated by cuttings of half-ripened wood under mist in midsummer. These plants may be used for summer bedding in warmer areas.—FREDERICK G. MEYER, *New Crops Research Branch, Plant Industry Station, Beltsville, Maryland*.

A Hybrid Victoria

During the summer of 1960 Mr. Patrick Nutt, who is in charge of the water-lilies at Longwood Gardens, pollinated *Victoria cruziana* with pollen from *V. amazonica* and obtained seed. One plant from this seed has been growing in the pools at Longwood this summer along with a plant of each of the parents. It is clearly intermediate, but also displays a remarkable degree of hybrid vigor which promises to make it far superior to the parents for display purposes. The leaves grow much more rapidly and reach a larger size. Even by August 1st, leaves had attained the diameter of 6 feet 5 inches, whereas the greatest leaf diameter previously obtained here by *V. amazonica*, the larger of the parents, was 5 feet 3 inches in September of 1960. The flower also is larger and opens earlier in the evening.

Longwood Gardens expects to give this hybrid a cultivar name, 'Longwood'. This will be done after the current growing season when all the records are in.—D. G. HUTTLESTON, *Longwood Gardens, Kennett Square, Pennsylvania*.

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